GAS

JUNE, 1953

New concepts needed in selecting engineers . . 31

How well do girth weld sleeves resist stress? . 87

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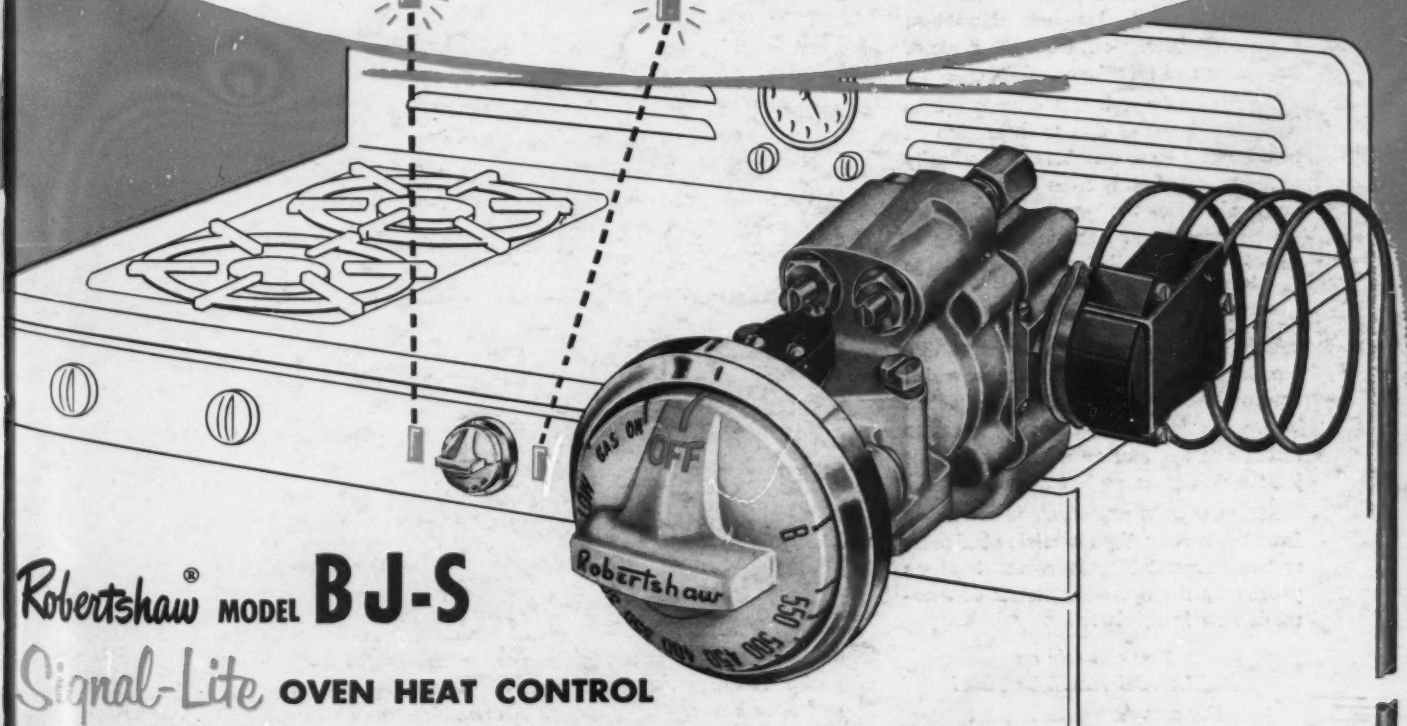
Completely AUTOMATIC OVENS in YOUR GAS RANGES

1. Gas on

2. Oven at pre-heat temperature



Robertshaw® MODEL BJ-S

Signal-Lite OVEN HEAT CONTROL

Automatically signals when the gas is on and *again* when pre-heat temperature is reached and the oven is ready for loading.

The "Signal-Lites" are operated by mechanical switches not subject to varying gas pressures therefore positive and sure in operation. Can be installed on manifold panel or mantel back.

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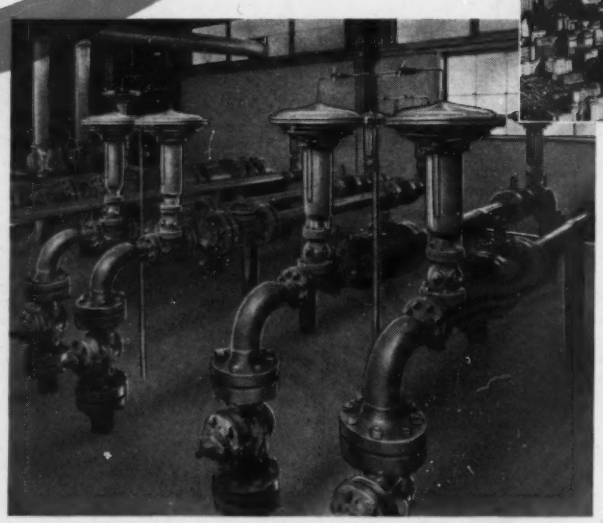
SPECIFY RELIANCE TYPE "P" *Streamflow* REGULATORS FOR SUPERIOR PERFORMANCE



A battery of 2 inch large capacity type "P" streamflow *gas pressure reducing regulators, instrument controlled, on a large western distribution system.*

Single valve construction eliminates possibility of knocking and insures streamflow of fluids with minimum turbulence.

Expansion of fluids occurs downstream, thus relieving working parts from any scouring action or shock. A removable valve seat tube with long extension throat made of stainless steel, takes the force of expansion and turbulence.

Freezing of valve and other working parts is minimized due to expansion of fluid beyond these members. The velocity of fluid moving away from outlet of regulator minimizes the possibility of ice or frost formation and the force of expansion is gradually dissipated over a large area.

The power for valve operation is transmitted from a conventional type of diaphragm chamber to a cam member which actuates a bell crank carrying the valve. The valve is self-centering with orifice throat and operates on a ball and socket joint which gives perfect alignment.

ALL RELIANCE REGULATORS are made from the best quality materials obtainable and their dependable performance has been proven by the operating results of thousands now in service.

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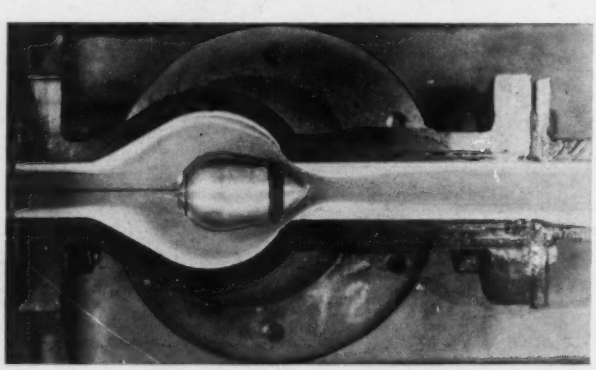
For complete data, request
Bulletin No. 42-C



Sectional view of streamflow *characteristics—valve in open position. Note curvature of fluid flow in* streamlined *movement and clear converging of stream discernable at outlet throat.*

RELIANCE REGULATOR DIVISION
1000 MERIDIAN AVENUE, ALHAMBRA, CALIFORNIA

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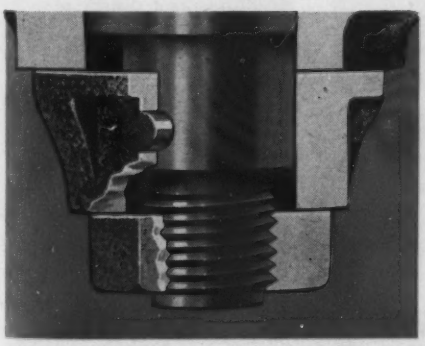
LubOseal® Gas Meter Stops

(Pat. app'd for)

PLAIN HEAD AND LOCK WING IN STOCK IN SIZES ¾" THROUGH 2".

are really *Tamperproof!*



LubOseal Gas Meter Stops are so constructed that gas leakage cannot be caused by the customer!

- Key locked in place by pin through large diameter on key and blind hole in washer!
- Key will turn without shearing pin if torque is misapplied to washer!
- Stop will operate satisfactorily and safely even though nut is removed!
- Tightening nut will strip threads without shearing pin and result only in higher turning torque!
- Socket head pipe plug used in grease port requires an uncommon tool, which discourages tampering with grease system!
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- Plus all the LubOseal long-life features!
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GAS

29th Year of Publication

JUNE 1953 · VOLUME XXIX · NUMBER 6

June 1953

We Need to Change Our Thinking on Selection and Training of Engineers ... 31
By Morris S. Viteles

Load Forecasting Using the "Normal Weather Pattern" ... 35
By M. Frank Knoy and John L. Turnan

Conference Camera ... 39

Money-Savers ... 40
By R. E. Haun

"Here's What I'd Like to See in Gas Appliances and Servicing . . ." ... 42

Utilities Are Recognizing the Wisdom of Having Sound Servicing Policies ... 44
By C. George Segeler

Wholesale Rate Increases Under Bond Threaten Distributors' Financial Position ... 47

New NBS Flowmeter Gives Gas-Viscosity Data at High Temperatures and Pressures ... 49

Cincinnati Gas Takes Honors in PUAA Better Copy Contest ... 54

Vary Techniques in X-Raying Welds ... 56
By Harold Hovland

Waste Gas Burner Disposes of Gas Vented From Odorizer Tanks ... 56
By N. A. Manfred

Pipeline Section —

How Well Do Girth Weld Sleeves Resist Loading and Bending Stresses? ... 87
By G. B. Grable and G. M. McClure

Subcommittee 8's Long-Range Goal: Reducing Accidents to "Acceptable Levels" ... 92
By Fred Hough

151 Pools Now Storing 1292 Billion Feet of Gas ... 98

Continuous Measurement of Water Vapor in Natural Gas Achieved With New Recorder ... 100
By W. M. Deaton

Herscher's Financing Problem: Who Would Own the Stored Gas? ... 111

Comment —

Thermally Thinking, *by the Editors* ... 25

Technical Trends, *by Guy Corfield* ... 29

Departments —

New Products	58	People	81
Trade Literature	62	Pipeline People	106
Associations	68	Pipeline News	108
Calendar	71	New Pipeline Products	120
News	74	Progress Reports	122

Advertisers Index ... 126

IN THIS ISSUE

This manifold, used for painting meter risers in groups, is one of the "Money-Savers" discussed on pages 40-41.

•

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GAS is published monthly by Jenkins Publications, Inc., 198 South Alvarado Street, Los Angeles 57, California. Subscription price, United States and possessions (in advance), 50 cents per copy; one year, $2.00; two years, $3.00. All other countries: one year, $4.00; two years, $7.00. Acceptance under Section 34.64 P. L. & R. authorized. Member: The Controlled Circulation Audit, Inc.; National Business Publications, Inc. GAS is indexed regularly by Engineering Index Inc. Publishers: BUTANE-PROPANE NEWS; Handbook BUTANE-PROPANE GASES; BOTTLED GAS MANUAL; Annual BUTANE-PROPANE Catalog; WESTERN METALS. The name "GAS" is registered, U. S. Patent Office.

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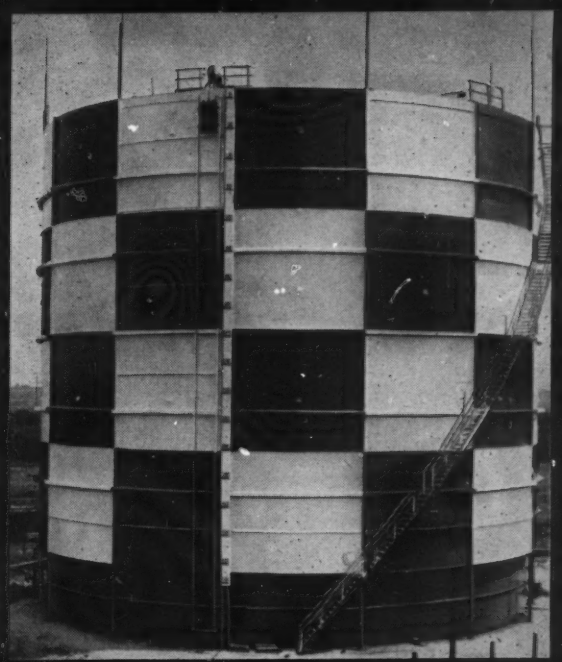

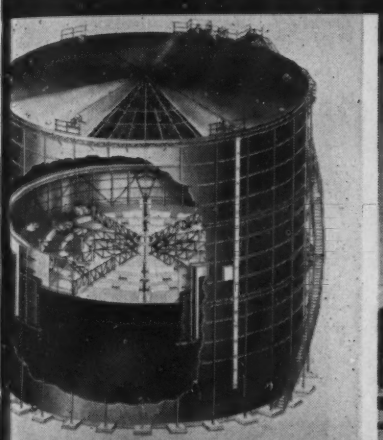

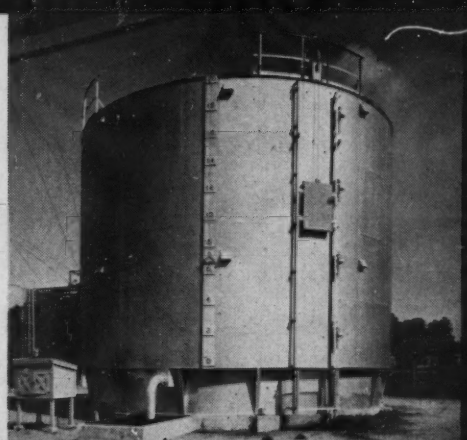

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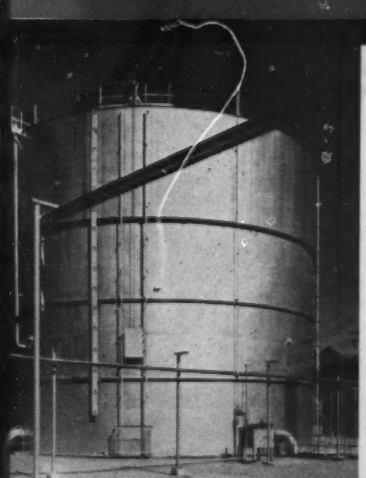

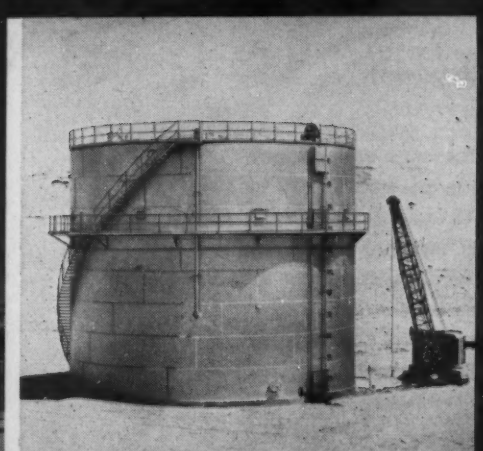

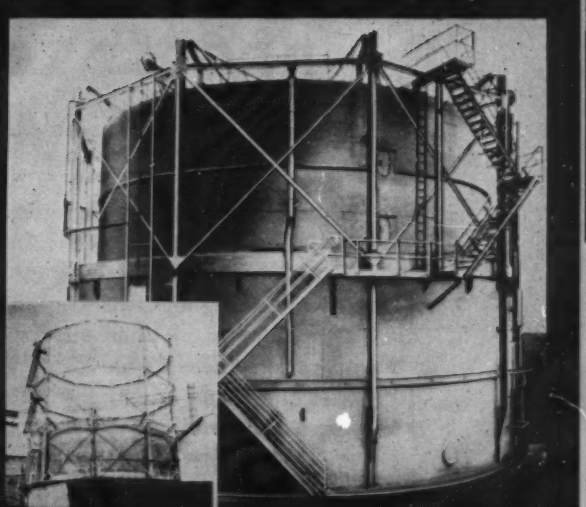

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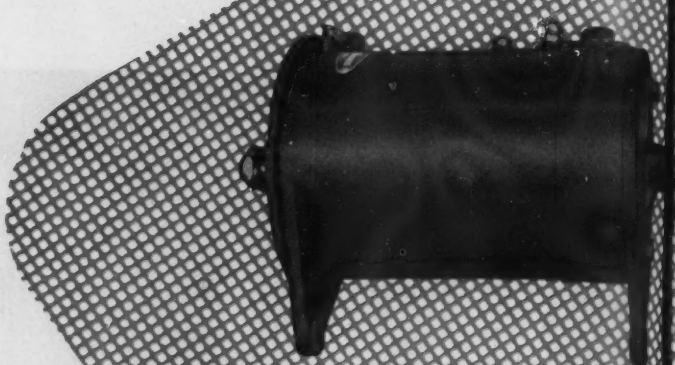
DELCO-REMY EXTRA-OUTPUT GENERATORS AND MATCHING REGULATORS

(Medium Duty—40 and 50 Amperes)



Delco-Remy extra-output generators are an economical answer to the electrical needs of public utility pick-up or panel trucks . . . other vehicles with additional lights, two-way radios, special electrical equipment in medium-duty service. For this type of operation, these Delco-Remy extra-output generators offer the triple advantages of low initial cost, simple installation and economical maintenance.

DELCO-REMY 40-AMP. GENERATOR has low cut-in . . . charges at engine idle from 11 to 17 amperes . . . attains full rated output at 18 mph when using a three-inch pulley.

DELCO-REMY 50-AMP. GENERATOR has slightly higher cut-in, about 9 mph . . . attains full output at 19 mph . . . for vehicles customarily operating at higher speeds, with minimum of slow driving.

See your nearest United Motors wholesaler for further information and application data.

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New

DELCO-REMY ALTERNATING CURRENT GENERATOR

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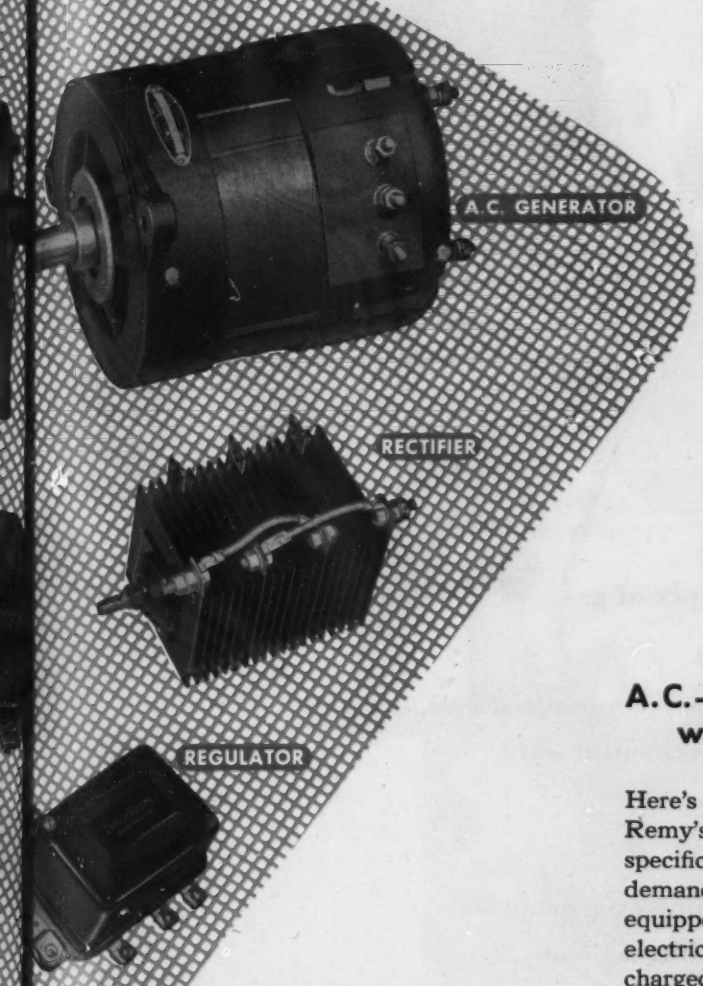

A.C.-D.C. charging system for vehicles with extra-heavy electrical loads

Here's the answer for "problem" vehicles—Delco-Remy's new long-lived A.C.-D.C. charging system! It's specifically designed to meet the *extra*-heavy electrical demands of public utility trucks, and other vehicles equipped with two-way radio, floodlights or any extra electrical units . . . ample current reserve picks up discharged battery quickly in operation.

With output ranging from 30-40 amperes at engine idle to 90 amperes at higher engine speeds, the new Delco-Remy A.C.-D.C. charging system meets all electrical needs under the toughest operating conditions. Included in the new system is the A.C. generator (alternator), a matching regulator for accurate voltage control and a rugged, dependable dry-plate rectifier which converts generator A.C. output to direct current.

Application packages for popular makes of cars and trucks are now available. The conversion job is simple, complete and profitable. For details and application data, call your United Motors wholesaler.

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WHEREVER WHEELS TURN OR PROPELLERS SPIN

How the best product in its field has been made still better

Not overnight, of course—but by a series of improvements gained through research and development resulting in *modernized* cast iron pipe. Tougher, stronger pipe with standardized mechanical joints that are bottle-tight for all working pressures and all types of gas.

All of our member companies have centrifugal casting facilities for producing tougher, stronger *modernized* cast iron pipe. All manufacture the standardized mechanical joint with interchangeable parts—a simple, fool-proof, time-saving joint as the gas industry well knows.

If you want the most efficient and economical pipe ever made for gas distribution, your new mains will be laid with cast iron pipe—centrifugally cast and with standardized mechanical joints. Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3.

CAST Q IRON

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

Modernized **cast iron**

This cast iron gas main, uncovered for inspection, is in fine condition after 119 years' service in Baltimore, Md.—one of more than 40 cities with century-old water or gas mains in service.

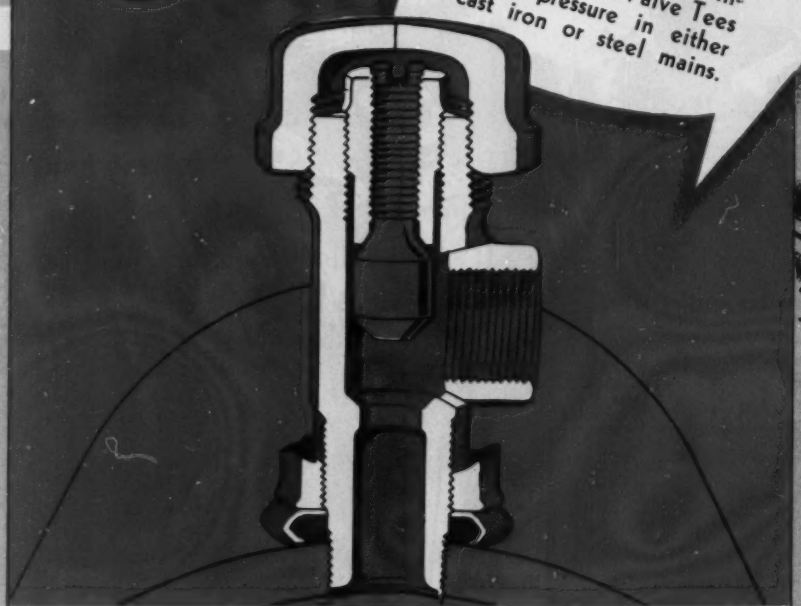
pipe for Modern Gas Distribution

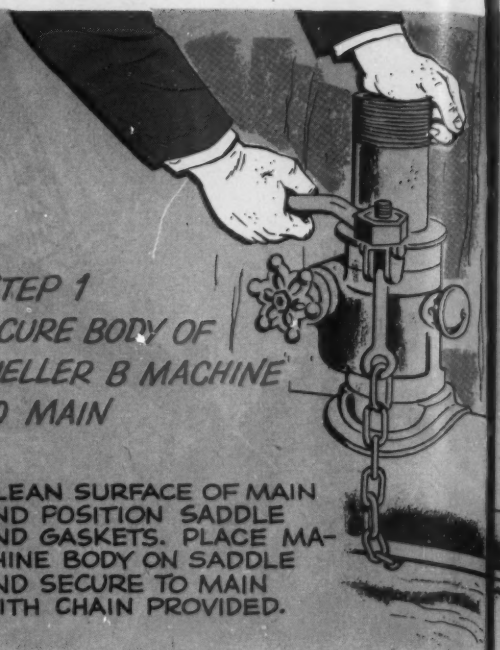
CONNECT SERVICE LINES

SAFELY

in cast iron or steel mains, without welding

Here's the simple step-by-step procedure for installing Mueller Machine Inserted Service Valve Tees under pressure in either cast iron or steel mains.





STEP 1
SECURE BODY OF MUELLER B MACHINE TO MAIN

CLEAN SURFACE OF MAIN AND POSITION SADDLE AND GASKETS. PLACE MACHINE BODY ON SADDLE AND SECURE TO MAIN WITH CHAIN PROVIDED.

STEP 4 TIGHTEN TEE

CAREFULLY BRUSH ALL CHIPS AWAY FROM BASE OF TEE, ALIGN, AND TIGHTEN TEE BY HAND. TIGHTEN BRONZE COMPRESSION NUT WITH A WRENCH. (NOTE: BRONZE NUT COMPRESSES RUBBER SEALING RING AND FORCES IT TIGHTLY AGAINST MAIN AND PLAIN PORTION OF TEE INLET—RESULTING IN A PERMANENT COMPRESSION SEAL.)

MUELLER SERVICE VALVE TEES

Mueller Machine-Inserted Service Valve Tees are expressly designed for installation under pressure in cast iron pipe or in steel pipe when welding is inadvisable. I.P. thread inlets have been found to be one of the strongest possible connections and develop the full strength of the pipe wall. The compression seal at the inlet consists of a rubber sealing ring within a copper retainer and a bronze compression nut. When the nut is tightened, the copper ring assumes the shape of the pipe and the rubber is highly compressed between the pipe and the plain machined portion of the inlet. This results in a highly effective and permanent seal. The built-in valve provides a simple and positive means of shut-off at any time and, with the completion cap, provides a double seal at the top of the tee when in the open position. Outlets are provided with welding or inside I.P. thread connections.

MULE

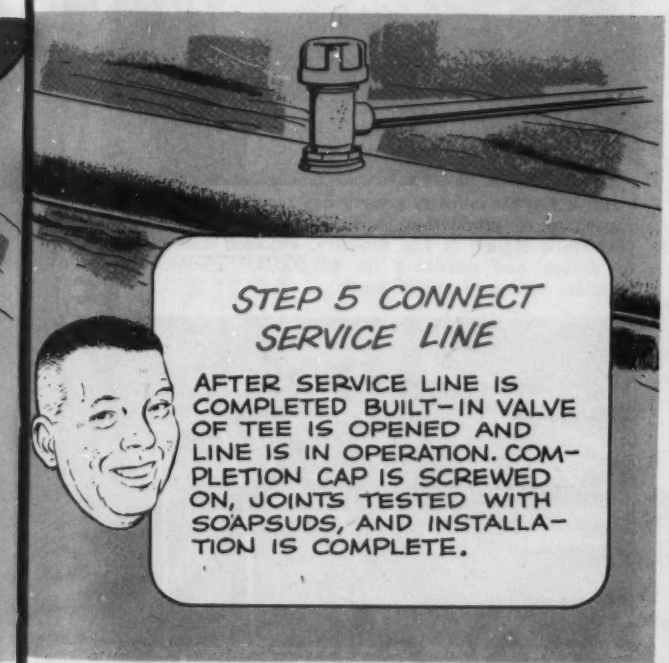
This is ano
step solu

STEP 2 DRILL AND TAP MAIN

FASTEN COMBINED DRILL AND TAP TO BORING BAR. ATTACH CAP AND BORING BAR ASSEMBLY TO BODY OF MACHINE. DRILL AND TAP MAIN, RETRACT BORING BAR, AND CLOSE BUILT-IN FLOP VALVE. REMOVE CAP AND BORING BAR ASSEMBLY.

STEP 3 SCREW TEE INTO MAIN

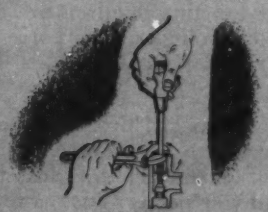
REPLACE COMBINATION DRILL AND TAP WITH E-Z RELEASE SCREW PLUG. CLOSE BUILT-IN VALVE OF TEE, FULLY RETRACT BRONZE COMPRESSION NUT, AND ATTACH TEE TO SCREW PLUG. REMOUNT CAP AND BORING BAR ASSEMBLY, OPEN FLOP VALVE, AND SCREW TEE INTO MAIN FIRMLY. RELEASE SCREW PLUG AND REMOVE ENTIRE MACHINE.



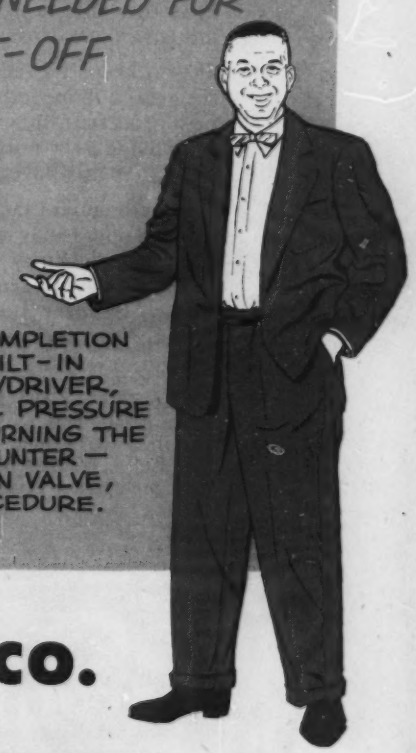
STEP 5 CONNECT SERVICE LINE

AFTER SERVICE LINE IS COMPLETED BUILT-IN VALVE OF TEE IS OPENED AND LINE IS IN OPERATION. COMPLETION CAP IS SCREWED ON, JOINTS TESTED WITH SOAPSUDS, AND INSTALLATION IS COMPLETE.

NO MACHINE NEEDED FOR FUTURE SHUT-OFF



SIMPLY REMOVE COMPLETION CAP AND CLOSE BUILT-IN VALVE WITH SCREWDRIVER, PUTTING ADDITIONAL PRESSURE ON THE STEM BY TURNING THE BRASS BUSHING COUNTER—CLOCKWISE. TO OPEN VALVE, REVERSE THIS PROCEDURE.



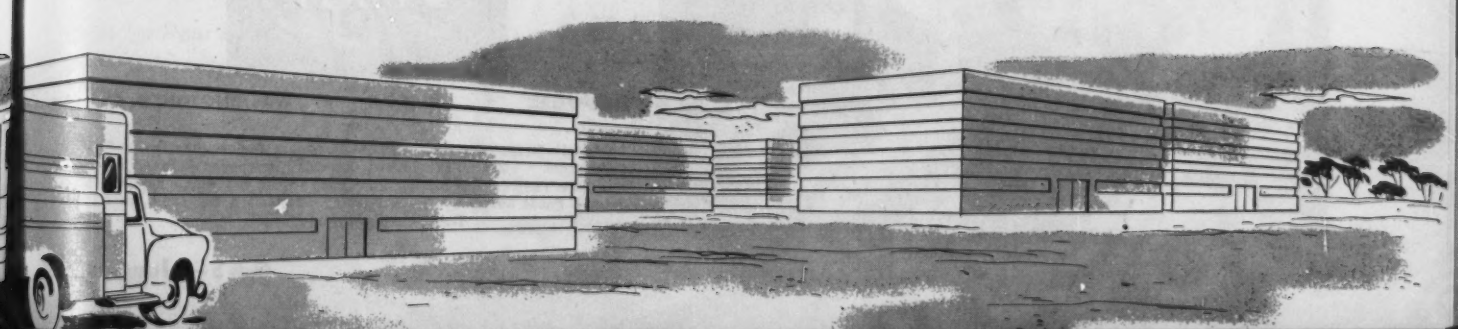
ULLER NO-BLO Method

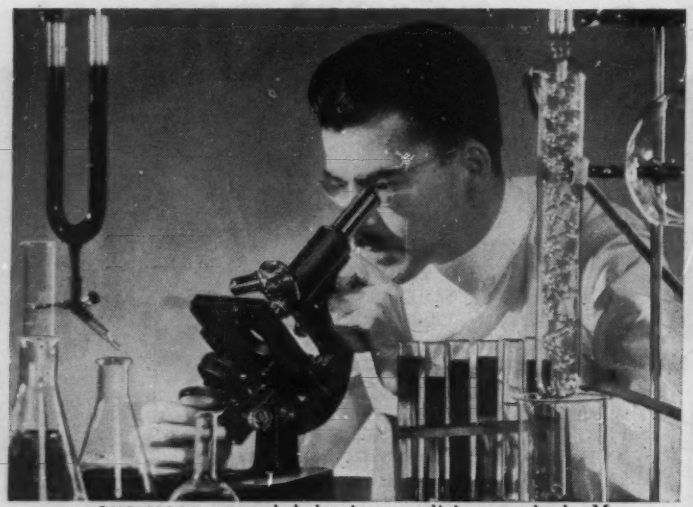
This is another of a series of gas distribution problems and their step-by-step solution by Frank Miller, Gas Service Engineer of Mueller Co.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS





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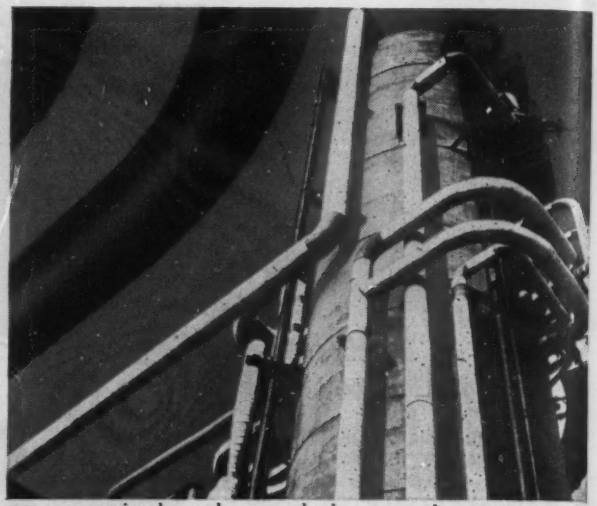


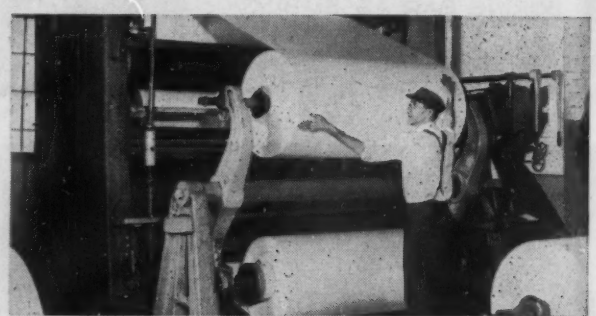
OIL companies know how much damage and waste can be caused by corrosion to pipelines and equipment. EBASCO has served Trans-Northern Pipe Line Company of Canada through corrosion surveys and application of various methods of corrosion control.

MANY DIFFERENT INDUSTRIES SOLVE INSIDE PROBLEMS WITH OUTSIDE HELP

Modern industrial expansion often creates special situations that demand special services. That's where EBASCO is able to assist many kinds of businesses and industries across the nation and around the world.

EBASCO keeps its services in step with the times. They are geared to meet the exacting requirements of today's new processes, new technologies, new horizons. Such knowledge is a must in serving industries like those shown on this page.

If your business faces a special problem, the services EBASCO offers may well be your answer. Our booklet, "The Inside Story of Outside Help," describes these services. May we send you a copy? Just write or phone Ebasco Services Incorporated, Dept. F. Two Rector Street, New York 6, N. Y.



PULP & PAPER industry growth has resulted in wide expansion of production facilities. Rayonier Incorporated, a leader in the industry, engaged EBASCO to design and construct its $25,000,000 chemical cellulose mill in Jesup, Georgia.

GAS pipeline of the East Tennessee Natural Gas Co. under construction. This pipeline, now in operation, carries natural gas from Greenbrier, Tenn., to the Atomic Energy Plant at Oak Ridge. EBASCO was engaged to handle the entire project from preliminary planning to "in service" operation.

STEEL plant under construction at Owensboro, Kentucky. The design and construction is being handled by EBASCO for the Green River Steel Corporation. This plant is scheduled for completion this year.

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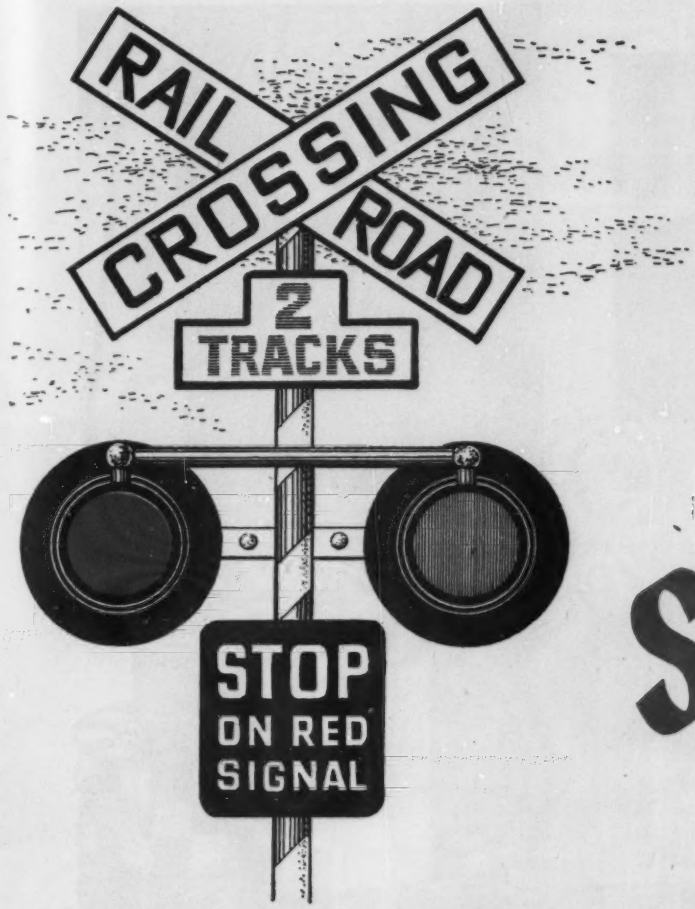

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Spotleak 1009

ANOTHER NEW SHARPLES ODORANT FOR FUEL GASES

Like a railroad crossing signal, SPOTLEAK 1009 warns at the first sign of danger.

SPOTLEAK 1009

- The universal odorant, can be used in either by-pass evaporation or liquid injection odorizers.

  Your supply problems are simplified—you need only one odorant.
- Is very stable—resists fading—remains active after long contact time in slow moving gas.
- Uniform composition means uniform odor at all times.
- Corrosion of equipment is minimized.

OTHER SHARPLES ODORANTS

Universal Type:
PENTALARM 86

Injection Type:
PENTALARM 1004
SPOTLEAK 1008

SHARPLES TRADE MARK CHEMICALS

Write for Data Sheet A-53, "Laboratory Determination of Mercaptans in Fuel Gases"

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Martin, Hoyt & Milne Inc., San Francisco • Los Angeles • Seattle • Portland
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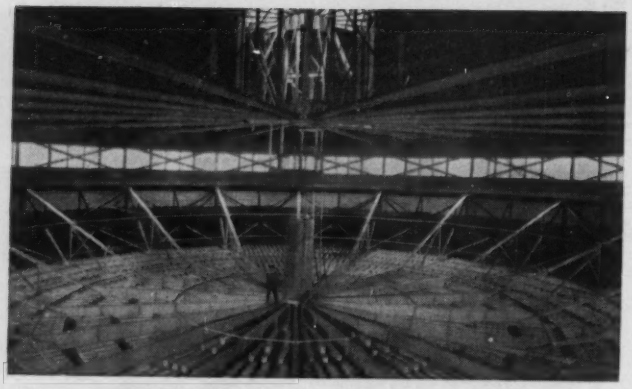
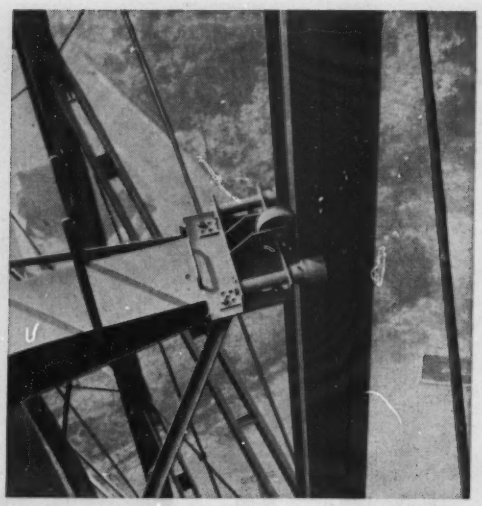
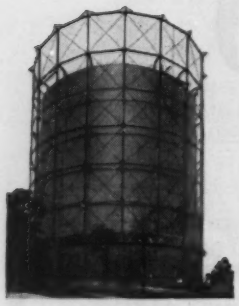
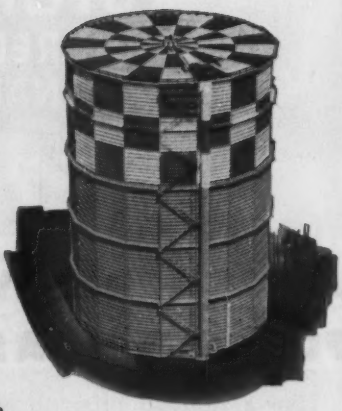
Airco Company International, New York









← Water seal or waterless →
when it comes to gas holders,

Koppers gives you better service!

BACKED by 76 years of experience and research in the field, Koppers complete gas holder service is your assurance of maximum uninterrupted gas holder performance.

Here's how it operates. Koppers engineers give your gas holding equipment a thorough going-over. They check, study, test . . . and submit their findings to you in a written report. This report predicts probable life of components and recommends necessary service and repairs.

On your O.K., the Koppers repair department moves in, fully equipped to follow through on all recommendations. When repairs are completed, your gas holder will be operating at peak efficiency. Koppers helps maintain that efficiency at minimum cost by dependable year-round service.

For complete details on Koppers inspection and repair service, write today to: Koppers Company, Inc., Gas Apparatus Dept., Metal Products Division, 236 Scott St., Baltimore 3, Md.

KOPPERS®

GAS APPARATUS

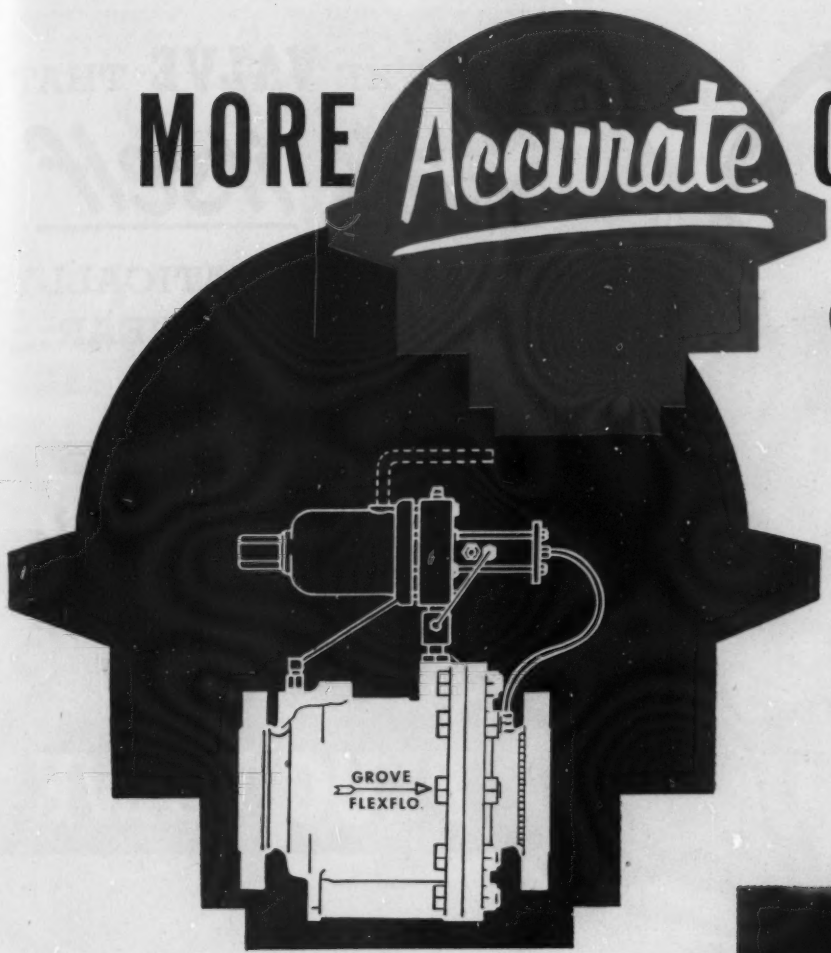
METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC., BALTIMORE 3, MD.

This Koppers Division also supplies industry with Fast's Couplings, American Hammered Industrial Piston and Sealing Rings, Koppers-Elex Electrostatic Precipitators and Aeromaster Fans.

Engineered Products Sold with *Service*

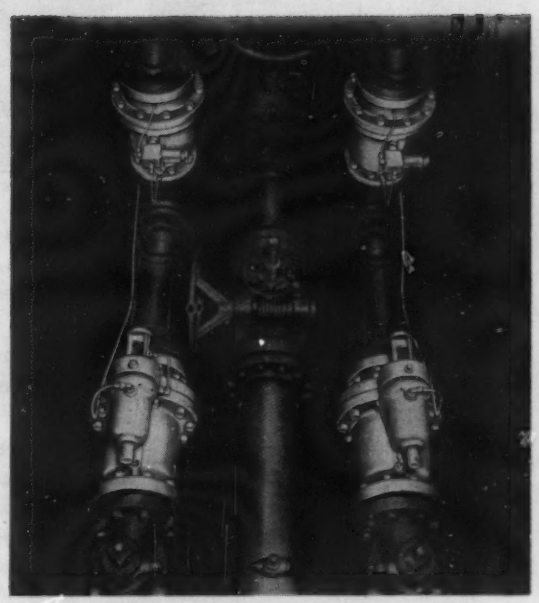
MORE *Accurate* CONTROL

OVER A WIDE RANGE OF *FLOW*



—with GROVE *FLEXFLO* Reducing Regulator

Greater accuracy, smoother delivery, and relatively noiseless operation makes Grove FlexFlo Pressure Reducing Regulators particularly suited for all gas pressure and flow requirements. FlexFlo expansible tube type regulators control outlet pressures within very narrow limits up to 100% of rated capacity. Extreme compactness and large capacity for their size effects large savings in expanding or redesigning existing installations. With no metallic moving parts to slam, chatter, corrode or stick, maintenance is at a minimum. Available in sizes 1" to 12" for working pressures up to 1500 psi and temperatures to 150°F. Write today for full details.



Grove Model 80-820 FlexFlo Pressure Reducing Regulators with spring loaded pilot, reducing from 450 to 125 psi on natural gas distribution system.

GROVE
SIMPLICITY
ACCURACY
SAFETY

GROVE REGULATOR COMPANY
65th & Hollis Sts., Oakland 8, California
HOUSTON • LOS ANGELES • NEW YORK

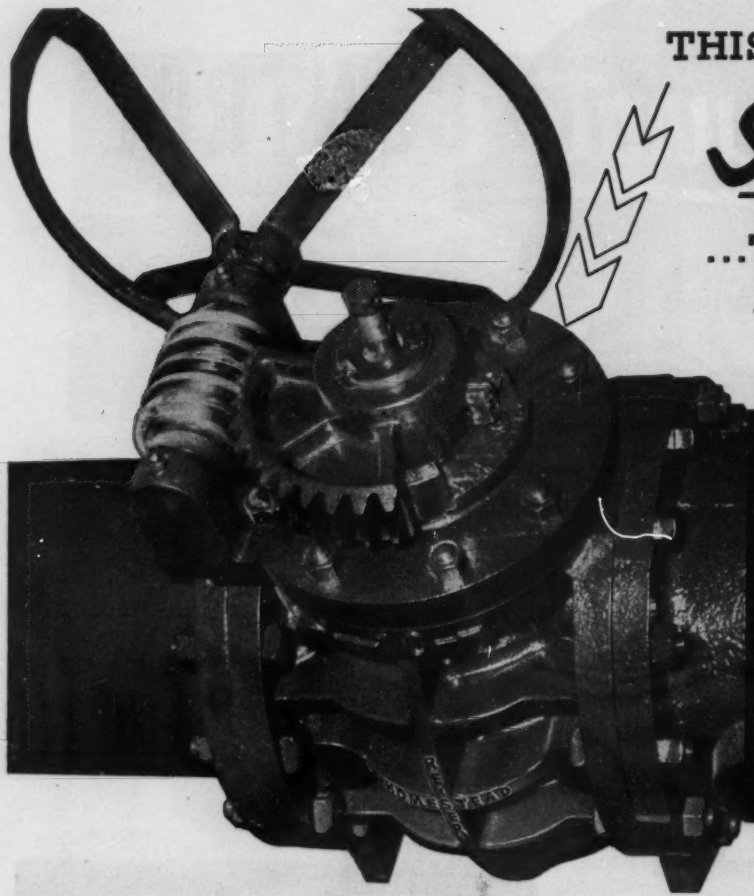
Southwest Division Offices
CORPUS CHRISTI, TEXAS — 1522 South Staples St.
ODESSA, TEXAS — 2604 Kermit Highway
DALLAS, TEXAS — 1334 Fidelity Union Life Bldg.
TULSA, OKLAHOMA — 318 Thompson Bldg.
LAFAYETTE, LOUISIANA — 101 Berkeley Street

GROVE
VALVES and CONTROLS

THIS IS THE **VALVE** THAT

Seals itself

...THAT AUTOMATICALLY ADJUSTS FOR WEAR...



HOMESTEAD-REISER

Self-Seald...Lubricated

PLUG VALVE

A Homestead-Reiser *acts on its own* to maintain a *drop-tight seal* at all times. It continually and automatically—without manual assistance—adjusts itself to make up for wear as wear occurs.

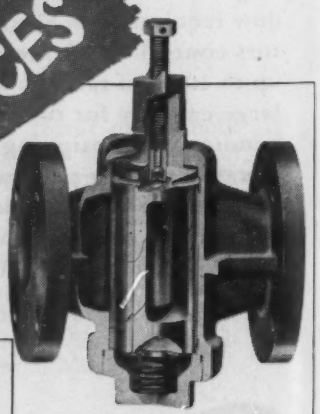
Its ability to thus effectively seal itself is due to the wedge-action of its two-piece plug which, *under line pressure,* causes the finely finished plug surfaces to constantly press outward to form a perfect seal against the mirror-like bore of the body. A full lubricant seal surrounds the ports and top and bottom of the valve.

Extra-long, leakless service . . . more operations between lubrications—up to 22 times more by actual tests with other well-known lubricated plug valves . . . less maintenance and lower plant operating costs result from their use.

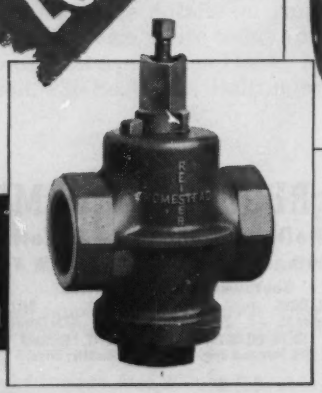
We can furnish them in semi-steel or cast-steel, 100% Port Area or Venturi, in sizes ½" to 14" for steam working pressures to 150 lbs., or oil—water—gas to 200 lbs.

Why not order today and prove them to your own satisfaction.

NOW! AT LOWER PRICES



Complete data and prices will be sent on request. Write today for VALVE REFERENCE BOOK No. 39. No obligation. For local distributor, see Yellow Pages of your Telephone Book.

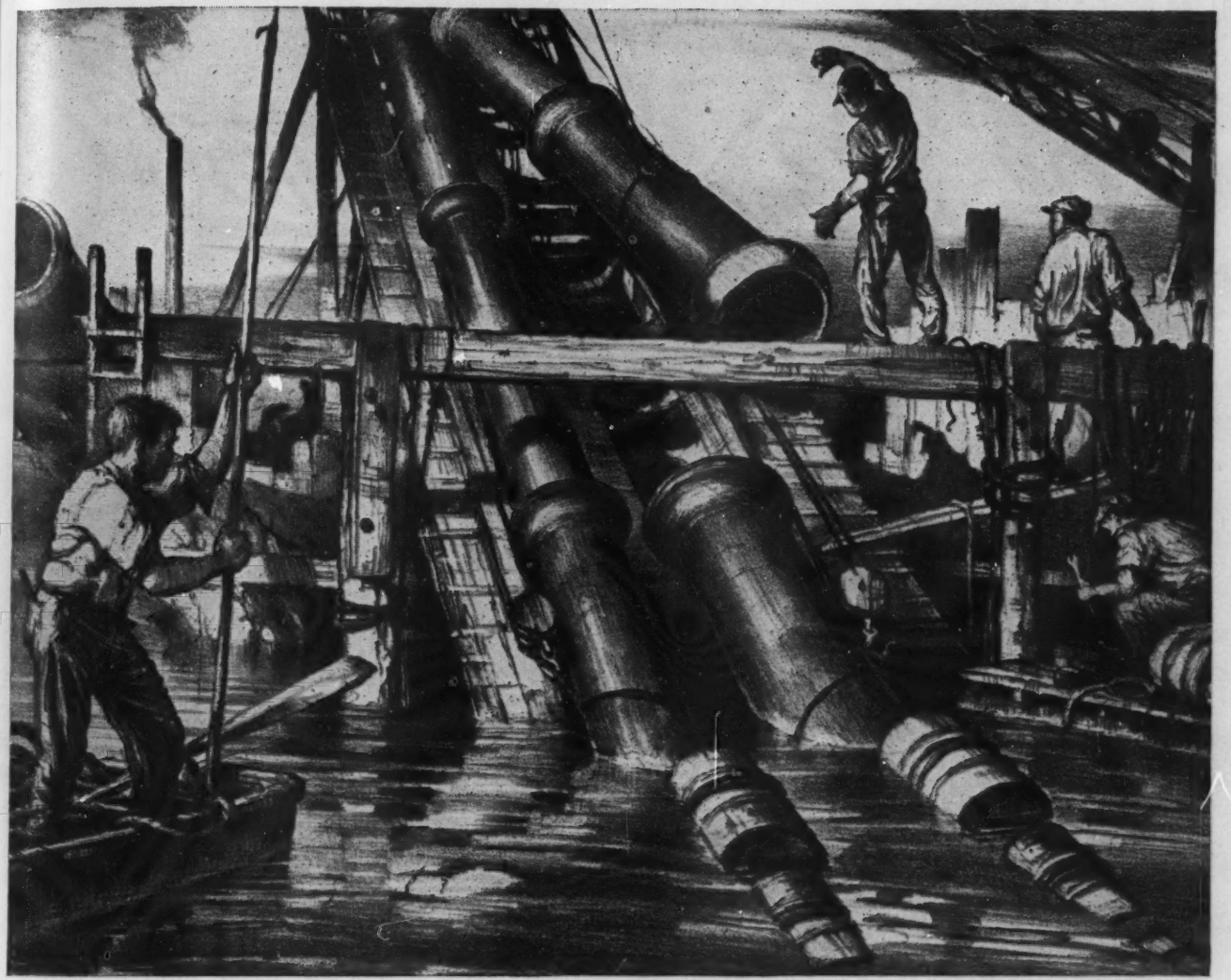


Sectional View of Full Port Area Homestead-Reiser Valve

Available in Straight-Way and 3-Way—screwed or flanged ends.

HOMESTEAD
VALVE MANUFACTURING COMPANY
"Serving Since 1892"

P. O. BOX 405 CORAOPOLIS, PA.



Lithographed on stone for U. S. Pipe and Foundry Co. by John A. Noble, A. N. A.

WHEN A CAST IRON water, gas or sewer line crosses a stream flexible joint pipe is frequently used. Joints that will deflect enough to meet installation and post-installation conditions and remain tight are most important in a submarine installation.

U. S. flexible joint pipe in all sizes, and pipe 30-inch and larger with other types of joints, are produced by the *pit cast* process. In sizes 2-inch through 24-inch, U. S. pipe is cast *centrifugally* in metal molds with bell-and-spigot, mechanical joint or plain ends.

Rigid quality controls are employed throughout the manufacture of all types of U. S. cast iron pipe from raw materials to finished products.

United States Pipe and Foundry Co.,
General Offices, Burlington, N. J.
Plants and Sales Offices Throughout the U. S. A.

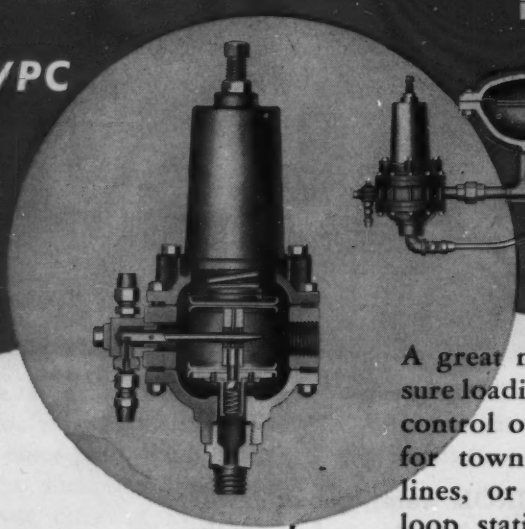
U.S.
cast iron
PIPE
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

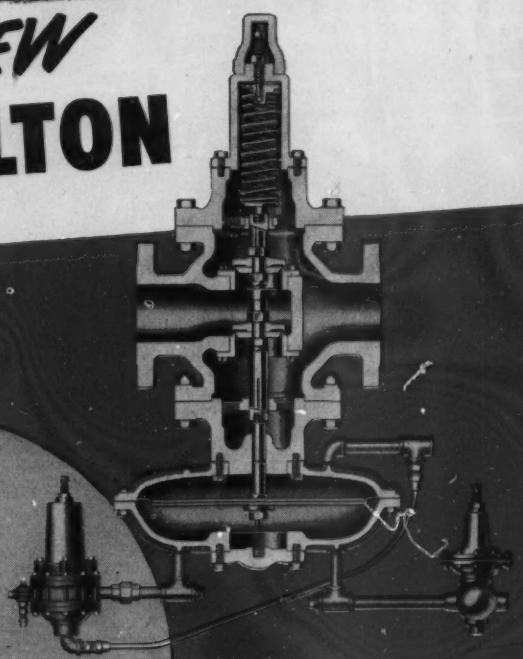
New Precision Control

WITH THE *NEW* CHAPLIN · FULTON

TYPE 51

VARIABLE PRESSURE PILOT and MODEL 44 VPC PRESSURE REGULATOR





A great new team—using pilot pressure loading—to insure stable accurate control over entire flow range. Ideal for town borders, compressor fuel lines, or high pressure distribution loop stations. Built for service—designed for safety.

Totally enclosed, all flanged construction. No atmospheric bleed. Regulator closes on failure. Adequate relief protection against overpressure. Compact installation. Simplified maintenance.

TESTED ACCURACY Proven variable pressure loading—provided by Type 51 Pilot—guarantees accurate outlet control.

WIDE COVERAGE Sizes 2"-12". Inlet pressure to 600 psi or 1200 with cast steel; outlet range ounces to 300 psi.

BUILT-IN SAFETY Totally enclosed. No external bleed. Internal parts under compression—you can't lose a valve or shear a stem. Diaphragms protected by relief valves against overpressure. Safe for pits or vaults with remote pilot provision.

SIMPLY SERVICED Wearing parts in regulator and pilot readily accessible. Without disturbing piping or diaphragm assembly, valves in both are quickly removable for inspection or replacement. Flanged removable seats. Interchangeable valves—hard or soft seats—reduced sizes. No pins or locknuts to adjust.

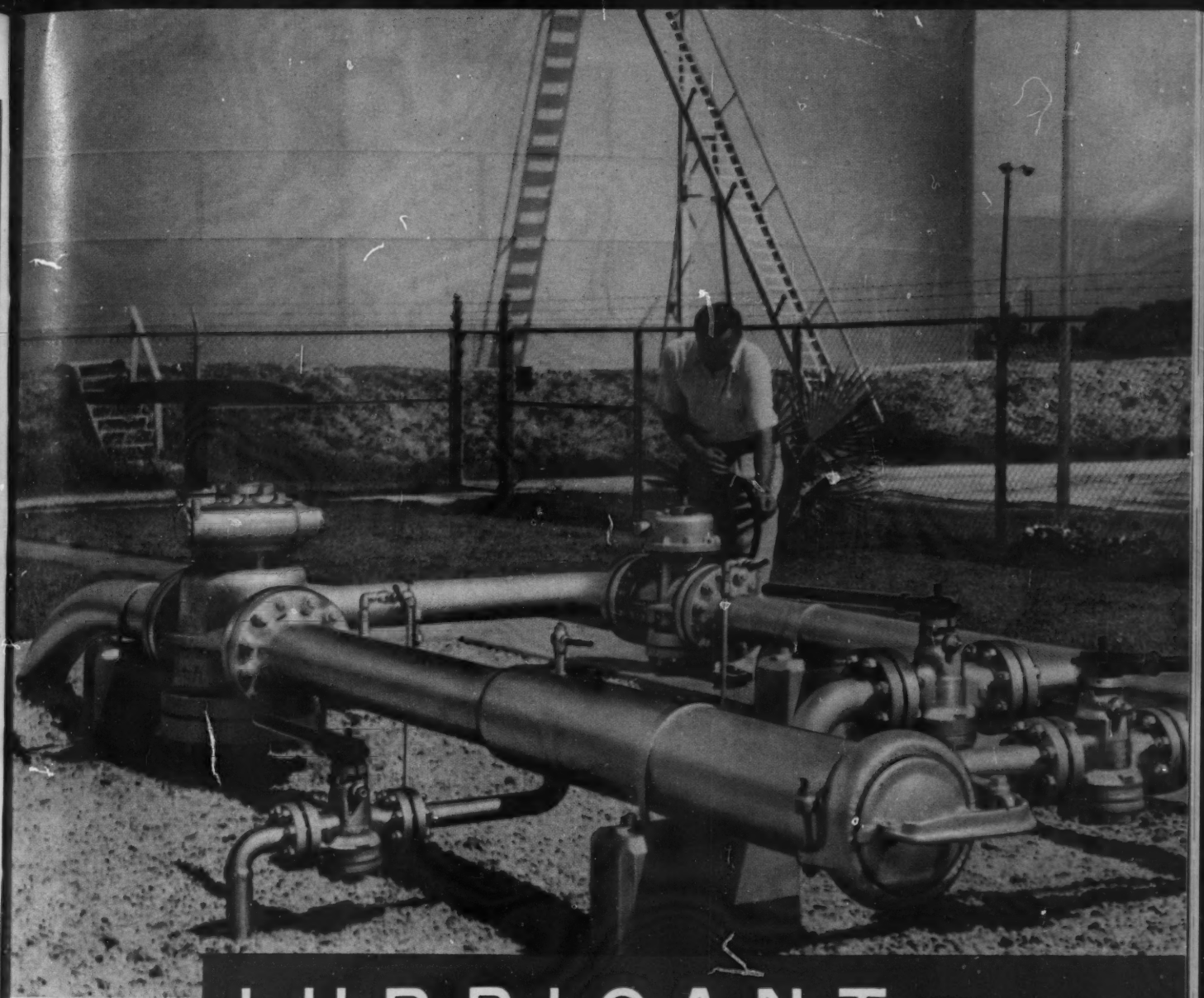
ACCURATE *DEPENDABLE*

CP MFG. CO.

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania



LUBRICANT—
THE NORDSTROM SEAL OF APPROVAL

In any valve, if a small leak starts, high repair and replacement costs are coming up. And, if the valve is in an often-operated manifold, trouble comes to a head sooner.

Unless . . . .

. . . . the valve is a Nordstrom.

Nordstrom valves have an extra seal against those small leaks. In Nordstrom valves, an even film of plastic lubricant surrounds the valve ports, sealing off the line fluid and at the same time filling any minute point of wear. Further, since there is no seat or disk in the eroding stream of flow, the chances for wear are cut to a minimum.

It's that extra seal of lubricant that has won approval for Nordstrom valves in hundreds of services where other valves aren't quite good enough.
Rockwell Manufacturing Company, Pittsburgh 8, Pa.

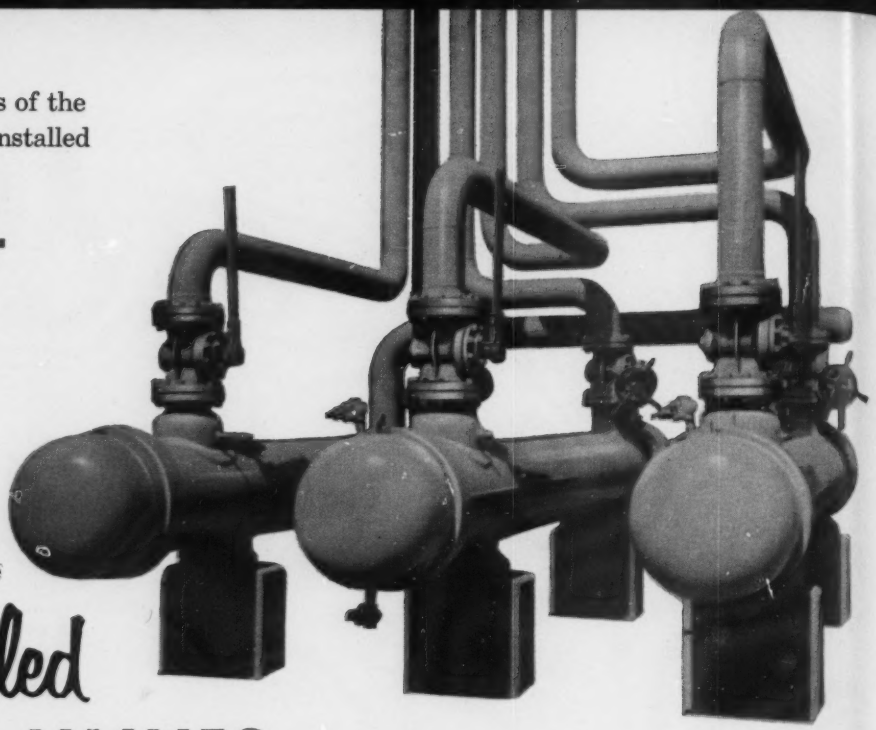
ROCKWELL Built Nordstrom Valves

Lubricant-Sealed for Positive Shut-Off

Another ROCKWELL Product

Regardless of the process, regardless of the piping arrangement, all valves are installed to do the same job:

TO CONTROL FLOW



Some valves do the job better than others. Some valves operate more easily than others in an emergency. Some valves stay tighter longer than others. That's because some (like these) are

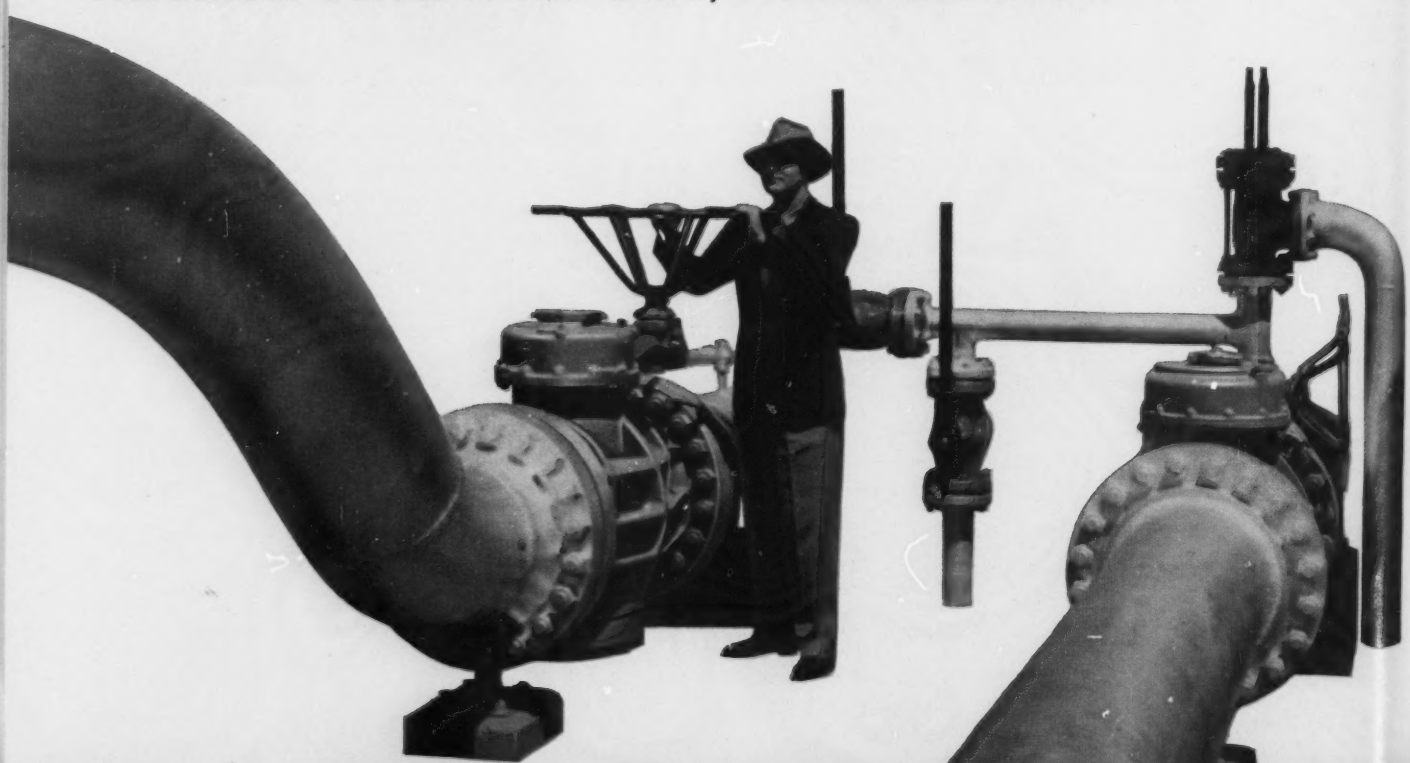
Lubricant-Sealed NORDSTROM VALVES

Nordstrom valves have a built-in lubricating system. The lubricant does two important things—it keeps the plug easy to turn so the valve shuts and opens in an instant when it is supposed to; it seals against the small leaks that become big and expensive and perhaps dangerous.
That's why Nordstrom valves

ARE YOUR BEST BUY

Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Nordstrom Valves Another Quality **ROCKWELL** Product



Two Fittings in One—

SKINNER-SEAL

COUPLING SADDLE

All fittings machined to receive check valve in case of high pressure.
Threaded to receive drill device and sealing cap.
Plain end outlet for compression coupling.
Complete packaged unit! Saddle and Street Tee Combined!
Extremely Safe! Thread leaks eliminated!
Saves Labor! Fewer parts to handle!
Made of malleable iron. Single, massive, electroplated bolt.

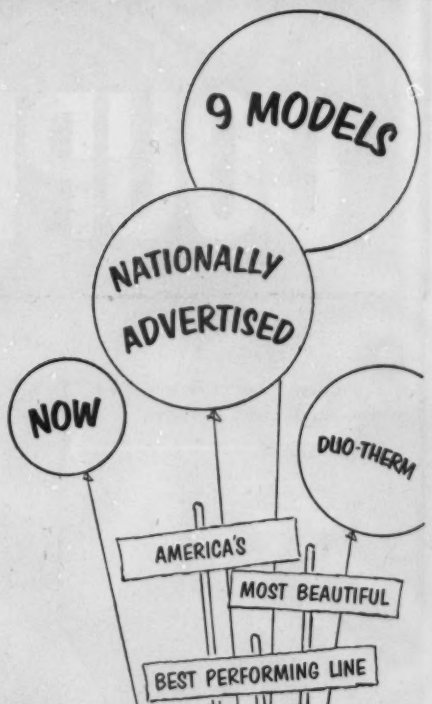
REQUESTS FOR SAMPLE SADDLES, ON COMPANY STATIONERY, WILL BE HONORED

M. B. SKINNER COMPANY, SOUTH BEND 21, INDIANA, U. S. A.

SKINNER-SEAL COUPLING SADDLE

ONE FINE DAY THIS SUMMER —

FOLKS WILL SUDDENLY WANT DUO-THERM GAS HOME HEATERS



- Again in '53, Duo-Therm will put gas heat on people's minds in midsummer . . . with a nationally advertised "FREE THERMOSTAT" OFFER.
  Offers early-season shoppers a special buy-now inducement. Helps dealers *move up* the selling season, *move out* more Duo-Therms.
- "Free Thermostat" Offer will be advertised in all these important national magazines:

LOOK August 11 — **HOUSEHOLD August**
COLLIER'S August 21 — **TRUE STORY September**
TODAY'S WOMAN August — **FARM JOURNAL August**
RURAL GRAVURE August 12

It's the curtain-raiser for Duo-Therm's 1953 advertising program, strongest in the home heater industry.

- It's an example of how Duo-Therm's *product* sales promotion can help you increase use of gas in the community you serve.

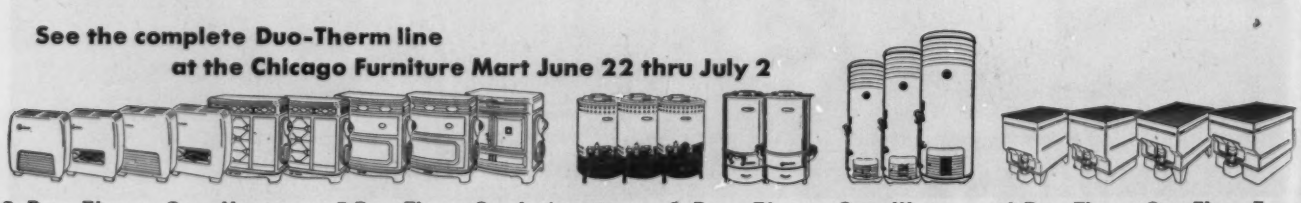
More than 2 million warmly satisfied customers . . .

DUO-THERM *Always the Leader*

Approved by
The American Gas Association

For further information write direct to Dept. G,
Duo-Therm Division of MOTOR WHEEL CORPORATION, Lansing 3, Michigan

See the complete Duo-Therm line at the Chicago Furniture Mart June 22 thru July 2



9 Duo-Therm Gas Heater vented models set new standards for beauty and performance. Exclusive Equaflame Burner and Automatic Power-Air Blower. 23,000 to 65,000 BTU imputs.

5 Duo-Therm Gas Incinerator models that will help you capture the big new market for garbage and trash-burning appliances. 2 and 4-bushel capacities. Automatic or manual controls.

3 Duo-Therm Gas Water Heater models, quality-built throughout. Liberal 10-Year Warranty. Heavy-duty tanks, thick spun-glass insulation, faster heating.

4 Duo-Therm Gas Floor Furnace models, extra-rugged for longer service. Liberal 10-Year Warranty. Floor or Dual-Wall registers. For homes new or old, with or without basement.

DUO-THERM is a registered trade mark of the Motor Wheel Corporation • Copyright, 1953

TESTING...always TESTING...

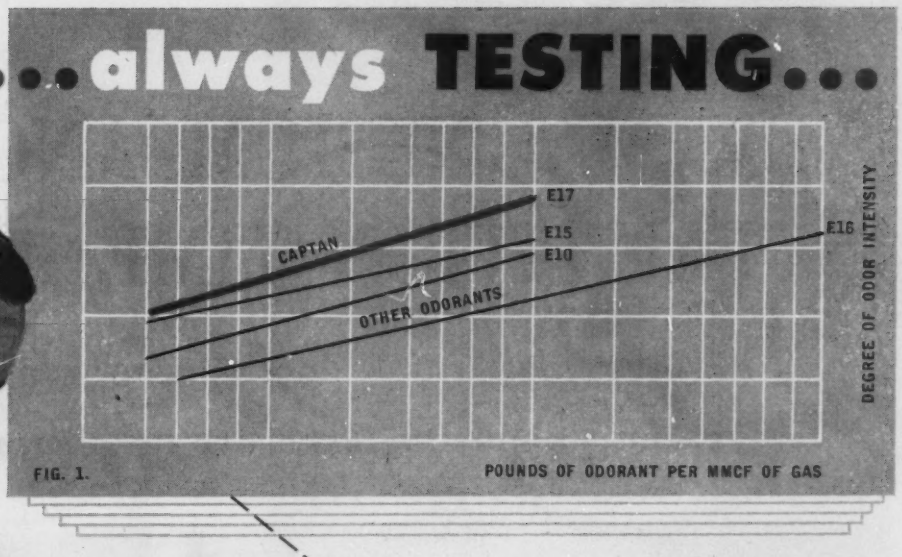


FIG. 1.

and always CAPTAN ON TOP!

But being best right now does not satisfy us . . .

NATURAL GAS ODORIZING CO., INC., is proud of the fact that odorization is their *one* and *only* business. Their objective is to continue to make the finest gas odorant possible.

To maintain outstanding leadership, CAPTAN is regularly tested, not only by the company's own, well-trained chemists, but also by independent laboratories which make comparative tests of all natural gas odorants.

Results of these practical tests definitely prove *CAPTAN best.* CAPTAN has established itself as the leader in this field and intends, through scientific research, to not only continue to be leader, but to widen the gap of its superiority over all others.

DON'T DELAY . . .
phone, wire or write us today.

Prompt Service from our . . .

- EXPERT SPECIALLY TRAINED ENGINEERS
- COMPETENT OFFICE FORCE
- STRATEGICALLY LOCATED WAREHOUSES
- RELIABLE SHIPPING SERVICE

captan

NATURAL GAS ODORIZING CO., INC.

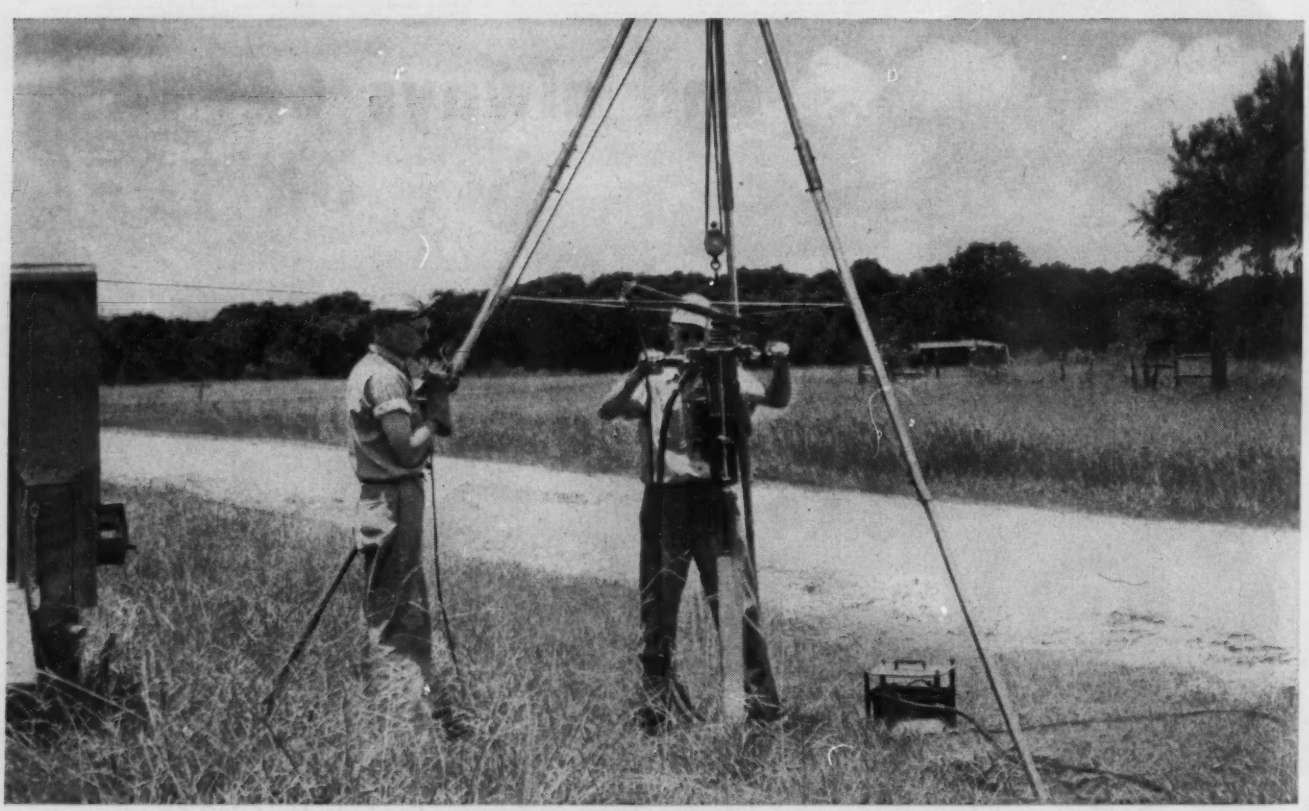
4363

P. O. BOX 1645 HOUSTON, TEXAS

DOW

NEW MAGNESIUM ANODE CUTS INSTALLATION TIME AND COSTS

Galvo-Pile, latest DOW development, can be driven into ground, eliminating extensive installation equipment



Now you can protect your underground equipment, pipelines and tanks easily, effectively and inexpensively with Galvo-Pile—the newest advancement in Magnesium anodes, developed by The Dow Chemical Company.

Tests made in various sections of the country show that Galvo-Pile is another effective item in the line of "tools" available for solving your corrosion problems. The elimination of backfill and the simple method used in driving this anode make it ideal in many locations, particularly in swamps and similar areas. Also, the savings in installation time alone will be of definite interest to you.

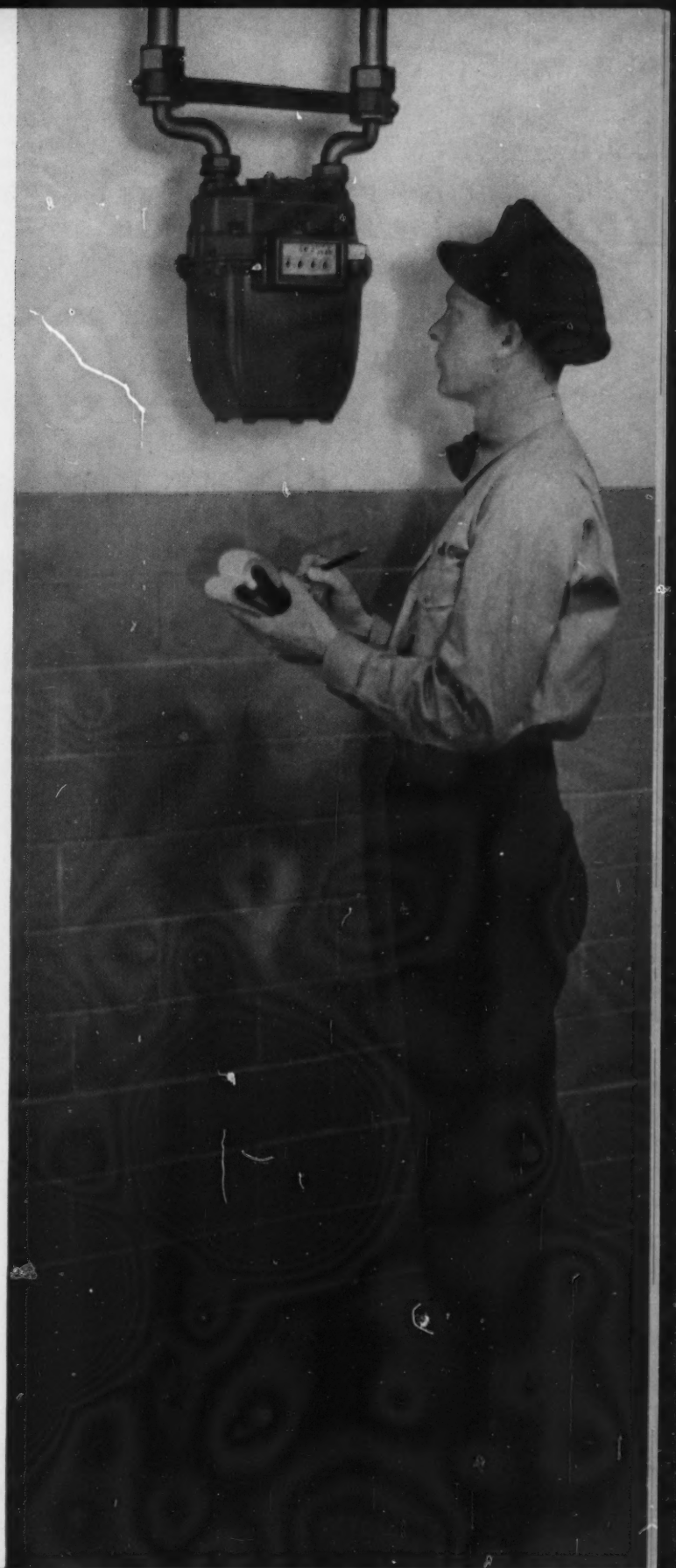
To help you determine the specific benefits of using Galvo-Pile for your cathodic protection assignments, call or write your nearest Dow sales office or authorized distributor. THE DOW CHEMICAL COMPANY, *Magnesium Department*, Midland, Michigan.

you can depend on DOW MAGNESIUM ANODES

DOW

FOR THE MAN WITH A LOAD ON HIS MIND

...The House Heating Load



Here is our answer to your meter capacity and safety problems when heating with gas. It's the new Rockwell No. 1 meter. It has a sturdy, pressure cast aluminum alloy case. From within its compact dimensions you get a generous margin of capacity—more than enough for any space heating job. You get peace of mind, too, since this meter has a high degree of impact resistance.

The light weight of the Rockwell No. 1 (only 22 lbs) permits easy one man installation. With offset swivels it will fit right into your present meter bar set; on new services you don't even need a meter bar.

Resolve now to replace your old style tin meters and obsolete types of cast iron meters with new Rockwell No. 1 aluminum meters. On either old or new service outlets you stand to gain from the accuracy, durability and maintenance ease that are basic to the Rockwell design.

ROCKWELL

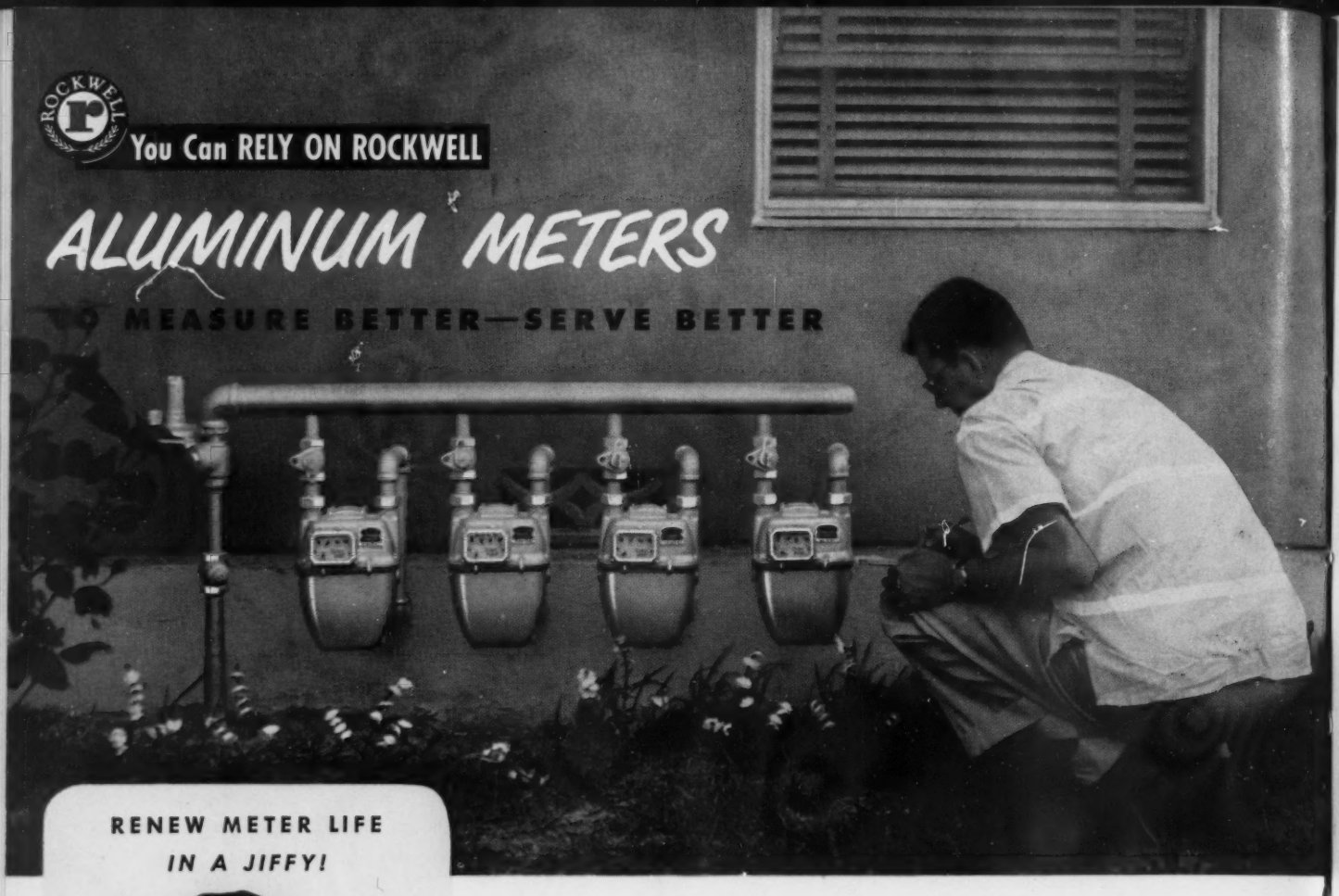
ROCKWELL No. 1 *Aluminum* METER

Weighs only 22 lb. Capacity 275 cfh. (at ½" pressure drop with 0.60 sp. gr. gas)

You Can RELY ON ROCKWELL

ALUMINUM METERS

TO MEASURE BETTER—SERVE BETTER



RENEW METER LIFE *IN A JIFFY!*

Just remove a few cap screws and pull entire measuring unit from the bowl type meter body. Replace old unit with either a new or rebuilt duplicate and the meter is ready for another period of extended service. Write for details.

YOU'LL PROFIT MORE when you measure your domestic services with Rockwell aluminum meters. That's because these lightweight, attractive measuring instruments are durable, lastingly accurate and the most economical to repair. For safety, aluminum alloy housings of high fracture resistance are used. These meters will not rust or corrode even when installed out-of-doors. And in the Rockwell design there is only one gasketed joint to seal against leakage.

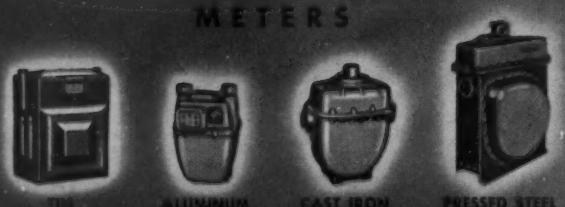
Now you can select from *three sizes* of Rockwell aluminum meters having capacities of 150, 175 and 275 cu. ft. per hour, respectively, at conventional ½ in. pressure drop ratings. Write for bulletin.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. • Atlanta • Boston • Chicago • Houston • Kansas City • Los Angeles
New York • Pittsburgh • San Francisco • Seattle • Tulsa

There's a ROCKWELL METER and REGULATOR for every use

METERS



TIN ALUMINUM CAST IRON PRESSED STEEL

REGULATORS

INDUSTRIAL SERVICE "1001" BALANCED VALVE

Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

$2 million for PAR

The AGA's promotion-advertising-research program received subscriptions of $1,986,493 in 1952, highest in its eight-year history, 22% above 1951, reports Committee Chairman N. B. Bertolette, president of Hartford (Conn.) Gas Co. Utilities representing 72% of meters, pipeline companies representing 69% of revenue from gas sales for resale, contributed. All but $95,000 was spent during the year.

1952 steel needs dipped

AGA, which has taken over and is continuing PAD's study on materials statistics, reports that last year's steel requirements slipped to 1,723,000 tons from 1951's 2,396,000. Bulk of the drop was in large diameter (16-in. and up) pipe, where 1,182,000 tons were used as against 1,728,000. The steel strike, which slowed planning and certification of new projects, was largely to blame.

Replacement costs recognized

Maine has a new law on utility rates that directs the state commission to consider original cost, current value, depreciation, and replacement costs. Enactment stemmed from a telephone rate case in which the state supreme court ruled the commission erred in failing to consider replacement costs in the rate base.

Florida anti-strike law out

The state supreme court has opined that employees of utilities do have the right under federal law to strike for higher wages. The Taft-Hartley act takes precedence, the court ruled, and the state cannot compel either strikers or employers to arbitrate.

Thumbs down on boiler fuel sale

Reversing its presiding examiners, FPC has denied Mississippi River Fuel the right to sell 4650 MMcf annually to Union Electric Co. of Missouri for firing steam electric boilers in the new Meramec plant. Meramec has plenty of coal loading facilities and 1 million-ton storage capacity, said FPC; besides, savings with gas would amount to only about half a cent per Mcf, advantages to customers would be slight. And Mississippi already has an 85% load factor. Such inferior usage is to be deplored unless there is a "positive showing that it is required by public convenience and necessity," said the commissioners.

Shutdown speeds line's okay

Around Spraberry, they're saying that the Texas railroad commission's shutdown order acted to speed FPC action on the Permian Basin Pipe Line Co.'s application for a feeder line to tie in with Northern Natural and El Paso Natural systems (see Pipeline News section). The carrier would tap the Spraberry pool for some of the gas now being flared.

An Eye on the Capital

FPC modernizes

The FPC's move to the new General Accounting Office building was hardly completed when Jerome Kuykendall, formerly of the Washington (State) Public Service Commission, was sworn in as chairman by Associate Supreme Court Justice Harold H. Burton.

As predicted here, Mr. Kuykendall was not opposed by anyone in the Senate, which approved his nomination to the new post by unanimous vote. He succeeds Thomas C. Buchanan, the Truman hold-over.

Story behind Williams' move

The Federal Power Commission's tendency, in recent years, to hold off on rate increases, or to allow these to go into effect months and even years after they may have been due, has been given here as one reason for the decision of Claude A. Williams, former president and one of the founders of the Transcontinental Gas Pipe Line Corp., to "cash in" his chips and resign. Mr. Williams, in fact, literally did "cash in," selling his 63,247 shares of common stock to a New York syndicate for some $23 a share, or a total of $1.4 million.

For years, Mr. Williams has tried in vain to get the FPC to okay a wholesale gas rate increase. The fact that the agency has put it off has forced the company to hold back on expansion when other pipelines were expanding. Transcontinental asked FPC for increases of $13.6 million in 1951, but was turned down in 1952. A new application was filed, but FPC allowed the increases to go into effect under bond only about two months ago. Meantime, Transco's net earnings dipped. Last year, the line even lost a franchise to supply Northeastern Gas Transmission Co. under a 1950 authorization, with FPC transferring the service to Tennessee Gas Transmission Co., a rival.

FPC can disclaim responsibility for the shift in personnel, but insiders see the relationship. If the agency doesn't reform its procedures soon, so as to act more quickly on rate applications, many pipeline executives fear that earnings will be lost irrevocably, as many already have.

The FPC actually has been allocated a bit more money for the next fiscal year than it received in the 1953 fiscal year, which ends June 30. The Inde-

Thermally Thinking

pendent Offices Appropriations Bill for 1954, passed recently by the House of Representatives, gives the agency $4.3 million, which is appreciably higher than the amount granted for 1953, some $4,085,700. Most other agencies, such as FCC and SEC, suffered cuts. Observers say that if FPC can't act faster with the new funds, there must be something wrong with its investigative procedures.

Lease transfers okayed

The transfer of natural gas leases to a subsidiary producer by a pipeline company has been approved by the Federal Power Commission here in the case of the Northern Natural Gas Co., which had transferred and sold all its gas leases and wells to Northern Natural Gas Producing Co., a subsidiary.

The FPC, in a memorandum opinion, indicated that it is "satisfied" that a bona fide transfer was made. The question was raised by the FPC itself when it began an investigation last November to determine whether the Northern Natural Gas Co.'s supply had been impaired by the transfer and sale, made without prior notification to the agency.

According to the memorandum approved by the FPC, its inquiry "failed to disclose that Northern had alienated any part of its gas reserves in a manner that does not permit Northern to draw on them to the full limit of production allowables."

It is said by experts here that this informal policy decision by FPC clears the way for other pipeline companies that desire to make similar internal corporate reorganization of their transmission and production facilities.

Important slip of paper

If, one of these days soon, the mailman drops off a letter containing a survey questionnaire from the American Gas Assn.'s subcommittee on plastic pipe standards, it would be an excellent idea to give it a treatment preferential to that usually accorded letters from creditors, cranks, or the perennially inquisitive types who make a practice of asking questions just for the sake of having something to compile. This isn't simply another questionnaire; it's an extremely important study that may one day lead to the removal of several major headaches in gas operations.

The idea behind the subcommittee's sampling is to find out what gas utilities want in the way of plastic piping, which isn't nearly as easy as it sounds. This fact was never more evident than at the exceedingly well attended plastic piping luncheon at the recent AGA distribution conference. To say the meeting brought forth little in the way of new information would be not only grossly unfair to the men who did a lot of work to get it going, but also not exactly accurate; nonetheless, it was hardly encouraging to hear some of the oldest and wisest heads in the business admit they don't know what they want. The subcommittee's chairman, Gordon Dye of Southern California Gas Co., was depending upon his audience to assist his group in setting its course, but very little help was forthcoming.

Here's the crux: manufacturers do not know what the various utilities want in sizes, coupling methods, or specific chemical formulae; utilities don't know what manufacturers are equipped to fabricate, and in some cases aren't certain at all what they want themselves. Having just "growed," the plastics industry is turning out copper pipe sizes, iron pipe sizes, and what might politely be termed "irregular" sizes. Plastic-to-plastic and plastic-to-metal joints are not standard, nor are formulae. A lot of manufacturing is being done on a custom basis, which as anyone knows is many times costlier than the production line method.

There's no use in kidding themselves, the plastic pipe extruders are not going to be able to offer a standard size. There will have to be several; but in the survey, if they can determine how the market breaks down, size-wise, they'll be in a much better position to concentrate on certain market sectors. They'll also learn more about the type of chemicals the pipe might be expected to contact, which will give them an inkling as to the optimum chemical composition of the pipe.

For their part, the extruders are also compiling some parallel information—what sizes they are equipped to make as well as the composition and properties of their products.

Once the mass of material has been sifted and analyzed, manufacturers and utilities should be ready to start moving together toward the common goal. But it will be a long pull. Already the notorious 10-year lapse between research laboratory and practical application has passed, and once again the urgent need for closer cooperation of the industry with its suppliers is demonstrated. The industry must unify to provide more assistance to those who, in the end, are striving to give it better tools to work with.

So the first order of business is to get those replies in. Incidentally, they are going to only a selected list, not all AGA members being represented, but any interested gas company that does not receive one within the next few weeks will be sent one on request. Address either Gordon Dye, Southern California Gas Co., Los Angeles, or *GAS* magazine. We'll pass them along.

Make it easier

Speaking of research and the 10-year lag (which have been mentioned in *GAS* several times in the past), Allan Lundstrum, president of Ohio Fuel Gas Co., Columbus, provided a different slant on the question in his keynote address at the recent AGA research and utilization conference, to wit:

"I think our industry is very weak in respect to making available for sale to customers equipment which embodies the principles and methods determined by our research. I have seen at least one instance of some very excellent thinking being done by our research committee and their agencies; yet, if any manufacturer had taken these ideas and incorporated them into a piece of equipment, he would have failed to get that equipment approved under our somewhat inflexible approval requirements.

"Under conditions which exist in the gas industry (and I think rightly so), no progress can be made at all by a manufacturer in developing a product,

Continued on page 67

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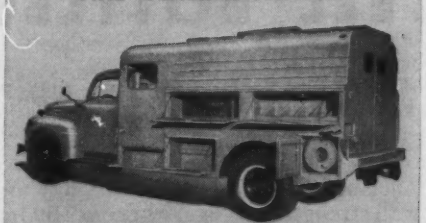
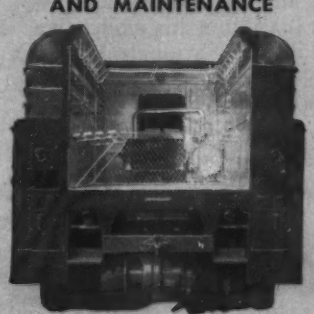


GAS LINE CONSTRUCTION AND MAINTENANCE



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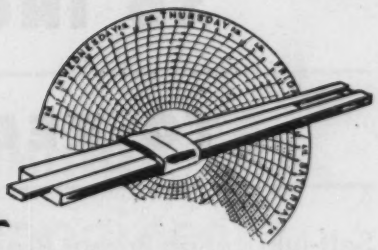
Technical Trends



• By GUY CORFIELD

Transistors

Transistors can be best vizualized as miniature vacuum tubes having the same function of rectifying and amplifying weak electric impulses. They are, in a sense, a return to and extension and development of the early galena crystals which, with the wire probe contact, made the first radio sets possible because of the ability to rectify alternating current "signals"; they can be considered as synthetic crystals which are so prepared and connected as to develop the additional and enormously important function of amplification. The transistor was first announced in 1948 in the type known as point-contact or "cat's whisker," and not until 1951 was the important junction type developed, but already they have shown the potential ability to largely out-perform and supersede the conventional vacuum tube, and their development is hailed by some as secondary in importance only to atomic fusion. As one writer has expressed it, "In the transistor . . . man may hope to find a brain to match atomic energy's muscle."

The essential component of a transistor is a small piece of solid semi-conductor of controllable resistance, i. e., of material intermediate between non-conductors of electricity such as glass and good conductors such as copper. The presently used material is the rare metal germanium and the quantity required to make a transistor is extremely small, the germanium element of the larger junction type being about 1/32 in. square and ⅛ in. long. The germanium is prepared by first purifying and then adding controlled quantities of "impurities" to produce what is termed the "n-type" or "p-type." The impurity added to form the n-type is arsenic or antimony, and causes the germanium to have excess electrons and thus be negative; indium, gallium, or aluminum are added to form the p-type as they cause the germanium to have a deficiency of electrons and therefore be positive or—to use the new terminology, to have "holes" which are positive and into and through which electrons can flow. An element of germanium, formed or built up with junctions of the p and n type, either p-n-p or n-p-n, can receive a small current on one side and amplify it on the other side. The two previously mentioned general types, point contact and junction, differ in the way the element is prepared and connected, and in specific use; in the present status of the art, the point contact may be made to more precise tolerances and has lower noise level, but the junction is more rugged and gives greater voltage gain.

The apparent advantages of transistors over vacuum tubes, which have stimulated their spectacular development, are that even in their present "infancy" they make possible electronic equipment that is one-fiftieth the size and one-fourth the weight of vacuum tube equipment, is much less subject to over-all failure, has a very considerably longer life expectancy, requires only a small fraction of the power to operate, and is insensitive to vibration and shock. An interesting feature is that the transistor, having no filament, requires no warm-up time.

At present, the commercial development has not progressed beyond hearing aids (which can be made very light and small), but transistors appear to be applicable to radios, television sets (except the picture tube), computers, communication systems and, in general, to any use now employing vacuum tubes. One of the most promising sources of raw germanium is coal, where it is found in low concentrations principally in the lower ⅔ in. of the coal seams. To get an excellent semi-technical discussion on transistors, the reader is referred to the March 1953 issue of *Fortune* which carries an article entitled "The Year of the Transistor."

Storage of LPG in sandstone

Items have previously appeared in this column describing underground storage of LPG in reservoirs formed in salt domes by dissolving the salt with water. A recent new approach to this natural underground storage reservoir means has been made by Standard Oil Co. of California at a location only three miles away from their El Segundo refinery near Los Angeles.

Advantage was taken of a known water-filled sandstone stratum at a depth of approximately 3400 ft. A 12-in. diameter hole was drilled to this sandstone, at the bottom of which was installed a perforated 5½-in. liner surrounded by gravel, connected to the surface by 2-in. tubing. A total of 2,520,000 gals. of propane has been injected since the completion of this project in 1952, and 630,000 gals. have been withdrawn without contamination. Injection rate has been as high as 63,000 gals. per day at 700 psig, and withdrawal rate 42,000 gals. per day at 610 psig.

Flame temperature

Questions are often asked as to the temperatures of flames. Such temperature, of course, depends on the analysis of the fuel, whether it is being burned with air or oxygen, the temperature and pressure of the fuel-air or oxygen mixture, and the ratio of the volume of air or oxygen supplied to that just necessary for chemical combination to complete combustion of the fuel.

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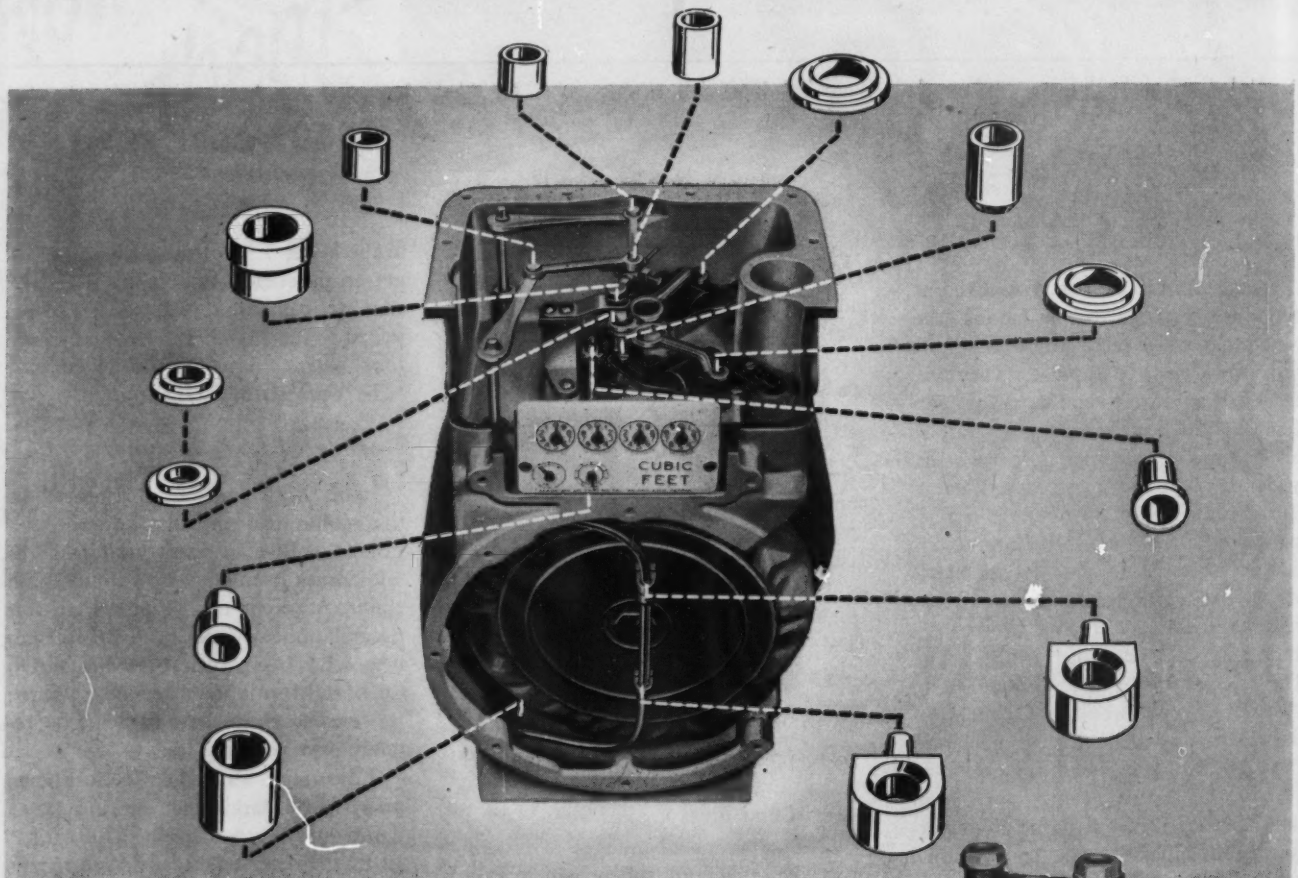

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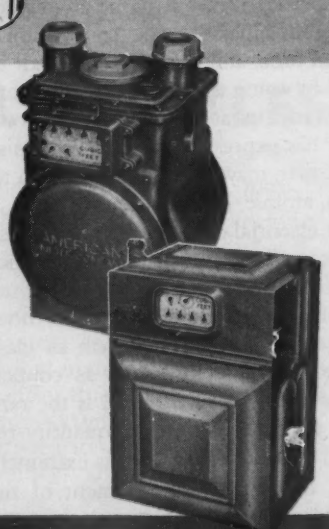

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We need to change our thinking on selection and training of engineers

The immediate need is not for the improvement of selection methods, as much as for focusing attention (1) upon the restructuring of the training program to conform to the current situation, and (2) upon the more effective use of technically trained personnel through the re-engineering of engineering jobs.

By **MORRIS S. VITELES** • Philadelphia (Pa.) Electric Co.

ACCORDING to recent estimates, industrial and governmental requirements for engineering graduates during the current decade will be in the neighborhood of 30,000 per year[1]. An analysis of data on engineering school enrollments and of civilian and military needs (by the Engineering Manpower Commission of Engineers Joint Council) indicates that the number of graduates available for jobs in government and industry will be approximately 17,000 in 1953; 11,000 in 1954; 10,000 in 1955, and 16,500 in 1956. This analysis, and data from other sources,[2, 3] indicates that the current shortage of engineers will extend for at least five to ten years.

The extent of the current shortage in engineers is indicated in the fact, reported in a survey of 176 companies, made by the director of placement of Northwestern University[4], that these business and industrial concerns filled only 64% of their requirements for engineering in 1952. It is anticipated that in 1953 requirements will be increased by 25%, at a time when an appreciable percentage of graduates will be called to active military duty.

Under such conditions, it may seem academic to devote any time whatsoever to the consideration of improved selection techniques. On the contrary, it might seem better to turn attention toward the preparation of bigger and better booklets describing the company; to a more extensive recruiting program; to the use of propaganda techniques which will place the company in a favorable competitive position in meeting its needs for engineering graduates. The facts (reported in the 1948 survey of "College Graduates in Industry" by the National Industrial Conference Board) that on the average about 300 different business firms approached each of 60 colleges for graduates in 1947, and that 2000 or more different business firms approached three of these colleges, may indicate that this is exactly what industry is doing[5]. Moreover, in some instances, it would appear that only a brass band is needed to complete the elaborate ceremony with which the newly hired young engineer is inducted into the organization and introduced to the vistas spread out before graduates of our engineering schools.

Labor pool

This situation is not one in which improved selection techniques can be used to best advantage. To say this is merely to point out the well-recognized fact that the efficiency of even the best validated selection method is very definitely a function of the size of the labor pool. The practical efficiency of most tests, and also of other predictors such as the interview, falls off rapidly as the size of the labor pool diminishes because of the necessity of hiring increasing proportions of available applicants in order to fill the established quotas[6].

Let us assume, for example, that in a company which is not using tests, eight out of every 10 engineers hired have proved to be satisfactory employees. Using a test with a validity coefficient of .50 (as high as that of the better tests available for engineer selection), it would be necessary to reject 40% of the applicants on the basis of test scores alone in order to improve selection to the point where nine out of every 10 engineers hired (instead of only eight) will prove to be satisfactory to the company. Adding to this the rejections for other reasons, it can be seen that a much smaller proportion of the applicants would be available for employment.

Assuming that the experience of the company using only traditional methods has been that only six out of every 10 of the engineers hired have proved satisfactory, with the same kind of test it would be necessary to reject 90% of the applicants on the basis of test scores in order to reach the point where nine out of every 10 men hired will prove to be satisfactory. I suspect that there is hardly a company requiring engineers which could accept such an attrition of the "labor pool" of graduate engineers.

In presenting such figures, certain assumptions are made concerning the quality of the applicants in the two situations, the degree of similarity between recruiting and selection methods, and the standards used in assessing the performance of the engineer. Disregarding, for present purposes, the statistical technicalities, a number of generalizations can nevertheless be formulated with consid-

This article has been adapted from a paper delivered at the AGA Transmission and Storage Conference, Chicago, April 30-May 1, 1953.

erable assurance. The *first* is that the addition of tests to traditional techniques finds its most useful application (a) where the objective is to hire only the very top quality of engineering talent, or (b) where experience has shown that traditional methods have not resulted in the selection of engineers capable of meeting even moderate standards of performance. The *second* generalization is that the company must in most instances be prepared to sacrifice a substantial proportion of its already inadequate labor pool to accomplish such objectives.

I question whether the objective of a company should be consistently that of hiring only the "cream of the crop." There also appears no reason for assuming that a large proportion of engineering school graduates is incapable of achieving reasonable performance standards. As a result, I am inclined to question whether, under current conditions, the addition of tests to traditional hiring techniques is the most productive approach to the selection of engineers.

Lower level jobs

To say this is not to raise questions concerning the use of tests in selecting personnel for lower level jobs. A prime factor, in contrast to the situation at lower job levels, is that in hiring engineers we are dealing with a group which has already been rigorously preselected by the university, and with men who have already undergone an intensive training program designed to develop skills which they are ready to put to immediate use at the time of employment. Furthermore, I am not discussing this situation in terms of companies where the stated aim in the use of tests is to select and employ only "cadets," as contrasted with "line engineers," i.e., to employ only young engineers who are viewed as raw material for progress into managerial and executive jobs.

In earlier years, such a distinction was actually made in the selection of engineers by the Philadelphia Electric Co. In conformity with this policy, a passing score on a test battery was a requirement for acceptance as a cadet engineer. The tests, which were a "clinically" selected battery, included measures of overall learning ability, of mechanical comprehension, arithmetical reasoning, problem-solving, and of practical judgment. Experiments conducted by other agencies[7, 8, 9, 10, 11] have shown that these (along with tests of physics training and aptitude, spatial perception, and interest tests) are, in general, the types which prove to be the best predictors of success on an engineering job. Selection norms on our test battery were established by giving the tests to approximately 300 engineering school graduates prior to employment. In addition to the preliminary screening of candidates by the employment division, those who had passed the tests were interviewed by representatives of the major departments of the company, and only those hired who were favorably rated by every departmental representative. In such interviews, observations and attention were focused primarily on interests, appearance, speech habits, attitudes, character and personality, while the tests were intended to measure only basic aptitudes. In fact, a comparison of pass-fail on the tests with ratings given during the interviews showed no correlation between the two. Under such conditions, it was found possible to maintain a low separation rate among newly hired cadet engineers and to provide a core of highly capable young men for future development.

The procedure described above has merit for purposes of what might be called "super-selection"—when the orientation is toward obtaining a group of men who are more or less tagged as promising candidates for filling top posts in the organization as vacancies occur through the years. It has considerably less merit in selection when the ultimate replacement of managerial and executive personnel is secondary consideration as compared with that of filling vacancies on jobs which require an engineering background, especially when there is a scarcity of engineering school graduates. This situation helps explain why, as a matter of fact, policy in the selection of engineers by Philadelphia Electric is in a state of flux, and why test results are not currently being given as much weight as in the past.

Broader perspective

While I have referred to the situation in my company, it seems preferable to consider the problems of selection and training from a broader perspective. Approached from this point of view, the immediate need is not for the improvement of selection methods, as much as for focusing attention (a) upon the restructuring of the training program to conform to the current situation, and (b) upon the more effective use of technically trained personnel through the re-engineering of engineering jobs.

In my opinion, it is necessary to make firm provisions for the systematic training of all newly hired engineers. From the viewpoint of a sound organizational philosophy, as well as of the immediate practical situation, we have passed the point where training can properly be given only to a group of highly selected and favored engineering school graduates. This view does not imply absence of a need for building up a pool of specially qualified individuals and for preparing them for middle and top management jobs. However, this is not the proper function of the training program for newly hired engineers, although progress during such training can be viewed as an aid in the selection of the more promising candidates for future training and ultimate advancement to top level jobs in the organization. From this point of view the training program for newly hired engineers may be conceived as having three objectives:

1. To provide such men with an opportunity to do useful work under direction and with guidance designed (a) to sharpen the skills which they have acquired in an engineering school, and (b) to prepare them for effective careers as professional engineers in the company;

About the author

Dr. Morris S. Viteles is director of personnel research and training at the Philadelphia Electric Co. where he is responsible for the development of improved methods for selecting and training personnel and for other applications of industrial psychology. He is also a member of the department of psychology of the University of Pennsylvania and director of the vocational guidance clinic.

Dr. Viteles has served as personnel consultant for the Yellow Cab Co. of Philadelphia and for such organizations as the Milwaukee Electric Light & Railway Co., Detroit Edison Co., Bell Telephone Co. of Pennsylvania. Currently he is serving as consultant in aviation psychology to the Surgeon General, U. S. Navy, and working on a number of problems dealing with national defense as well as in the effective utilization of manpower in industry.

As an author, Dr. Viteles has written articles on hiring and training personnel and his new book, "Motivation and Morale in Industry," is scheduled for publication early this summer.

2. to acquaint newly hired engineers with the nature of the company, its organization, the functions and interrelations of its various departments, its policies and practices;

3. to give the company an opportunity to observe new engineers at work—to check on work habits and other traits to be considered in qualifying the engineer as a "regular" or "permanent" employee.

The first of these objectives—that of giving the young engineer an opportunity to do useful work under direction and with guidance—represents the most important objective of the initial training program. There is here a contrast with the traditional approach in training which has been to place emphasis upon giving the young engineer an opportunity to try out various jobs; look around and examine the opportunities in the company; get to know the various people with whom he will have to work and to identify those who can "help him move onward and upward in the organization"[12]. To reject this traditional view—to place primary emphasis upon useful work—is desirable for four reasons:

Useful work

The first is that the shortage of engineers has created a need for people who can immediately apply the knowledge and skills which they already possess. There is work which needs to be done and which will remain undone unless the young engineers are put to work on productive jobs.

The second reason is that engineering school graduates want to be put on assignments where they can do useful work. Thus one conclusion from the survey conducted by the Edison Electric Institute is that "the graduate wants an initial opportunity to work where he can utilize his specialized training within a reasonable time"[13].

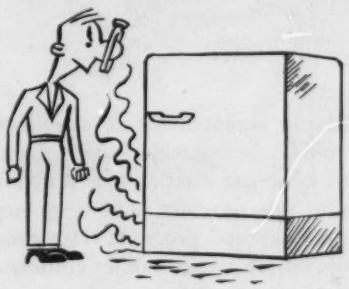
The third reason is that no young engineer should be considered as "marked for responsible positions"[5] unless he has demonstrated that he possesses work habits and attitudes of the kind which can only be observed as the engineer participates in the productive work of the organization.

The fourth reason is that it can be anticipated that a proportion—possibly a major proportion—of the young engineers will find their level in some productive line job. It seems both undesirable and unrealistic to encourage such men to set up levels of aspiration which they cannot possibly hope to achieve.

While the core of the training program is useful work under direction and guidance, there is also need for providing the young engineer with information about the company; its organization; the functions and interrelations of its various departments; its policies and practices, etc. This can be accomplished through an orientation program consisting of conferences and systematic visits to company installations. Such orientation not only provides the young engineer with information about the company and its operation but also basic knowledge concerning the "opportunities for personal development" and professional growth in the company. Such a program also provides an opportunity to meet company executives, managerial and supervisory personnel who would, naturally, participate in the conferences and field visits included in the orientation program. In order to make the program more attractive—specifically, to increase its attractiveness as a recruiting device—it might be extended to a total of 18 months with provisions (a) for two three-month assignments in other units of the company and (b) an opportunity for the young engineer to transfer to some other department for permanent assignment if his long spell of work in the department to which he was initially assigned plus the orientation course plus the two shorter assignments leads him to the view that he would feel happier in this other department.

While suggesting this possibility, I nevertheless would be inclined *not* to include the shorter assignments in the initial training program, but to make other provisions for "cross-training" as part of an over-all four-point development program. What I have just described represents the Step 1 in this four-point developmental program. In order to meet the needs of the company for a pool of highly qualified individuals, and also to provide every engineer with a maximum opportunity for development within the limits of his ability and interests, I would suggest that provision be made for three additional steps in an all-around program of engineering and executive development.

Step 2 in this program is to provide young engineers with opportunities to gain greater insight into technical and practical problems involved in design and operation than can be acquired in the initial program or through work experience alone. This can be done by setting up a systematic program of advanced engineering training to be made available on a continuous basis. This might take the form of well-planned scheduled monthly sessions in which technical personnel discuss engineering and operating problems in development and allied phases of company operations. This program might best be operated on an after-work-hour and voluntary basis. This not only represents the most practical arrangement, but also provides an indirect check on the interest of engineers in improving their usefulness to the company. The important point, however, is that systematic provisions be made for this kind of technical development.



What would you do?

- *Strong, pungent odor throughout the house. Seems to be strongest near the electric refrigerator.*

During regular working hours

8 companies would investigate. This could possibly be a gas leak.

1 company would not investigate unless reported as a gas leak.

1 company would advise customer to disconnect the electric refrigerator and would dispatch serviceman to investigate.

After regular work hours

8 companies would investigate.

1 company would investigate only if reported as a gas leak.

1 company would advise customer to disconnect the electric refrigerator and would dispatch serviceman to investigate.

The service policy rule book doesn't always give the answer to whether, when, or how unusual service requests should be handled by utilities. The 10 companies who provide their own answers here are PCGA member utilities; the problem was one of 35 posed by H. E. Benninghoven, San Diego Gas & Electric, in a survey reported at the PCGA customer service conference, Fresno, Calif., March 18.

4-point development program:

Step 1 would provide the young engineer an opportunity to do useful work under direction and with guidance.

Step 2 would provide young engineers with opportunities to gain greater insight into technical and practical problems involved in design and operation than can be acquired in the initial program or through work experience alone.

Step 3 would include provisions for the systematic interchange of engineering personnel of the company.

Step 4 would be in the form of an executive development program for a selected group of engineers who had demonstrated unusual promise for advancement.

Step 3 would include provisions for the systematic interchange of engineering personnel of the company. Here I have in mind simply an interchange of men on existing work assignments. It means that periodically and on a planned basis the engineering department would "swap" engineering personnel with the operations department. Other departments would participate to the extent that they employ engineering personnel. It might well be that such exchanges would cause a certain amount of temporary inefficiency for short periods as changes occurred. I question whether such inefficiency would be serious in scope, especially if the program of technical development suggested under Step 2 were followed. Perhaps the danger of inefficiency can be eliminated by limiting such exchange to engineers who were interested in testing the possibilities of other jobs and widening their knowledge and skill, and by definitely excluding those younger engineers who showed no promise of benefiting themselves or the company from such an exchange. Under any circumstances, temporary losses in efficiency would be more than offset by gains in flexibility on the part of engineers and by advantages in the way of improved interrelationships in the operation of the various units of the company.

The final step in this program (Step 4) would be in the form of an executive development program for a selected group of engineers who had demonstrated unusual promise for advancement. This might well be limited to men who had a minimum of 15 years of service with the company and be confined to only those men who have shown themselves by performance, by interest in supplementary training and other activities as having potential for development in the middle management and top management jobs. Job rotation would be a feature of this program as it is of Step 3 in the proposed program. However, it would be job rotation of an entirely different order involving a series of assignments to supervisory jobs in non-engineering as well as engineering activities. In a large sense, this might be considered as an analogue of the job rotation program which has been successfully employed by the Consolidated Edison Co. of New York and which has been described in a number of articles by Dwight Sargent with which most of this group will be familiar[14].

Maximum returns

A systematic program of training and development, such as that described here, can yield maximum returns only if it is restricted to engineers who are fully utilizing their time on engineering work. From recent reports[13, 15] it appears this is not true in the case of an appreciable proportion of engineers. There is growing opinion that, in many instances, engineers are devoting a portion of their time—sometimes a considerable portion of their time—to duties which can be adequately performed by less capable and less skilled people. Under such conditions, no combination of improved selection methods and improved training methods will fully solve the problem created by the current shortage of engineers. There is need, in addition, for an analysis of what engineers actually do and for a subsequent re-engineering of the engineering job. This approach involves a consideration of:

a. The possibility of "de-skilling" present engineering jobs by breaking down engineering positions into several simplified functions which can be handled by technically trained workers who are not engineering school graduates;

b. the possibility of taking advantage of existing programs of secondary school technical training or enlisting the cooperation of secondary schools in the area served by the company in developing a program of preparing young people (not qualified for an engineering education but otherwise competent) to handle such lower-level technical jobs;

c. the development of in-company training which will offer possibilities for upgrading competent young people in the organization to handle such jobs.

According to a recent report, "wise companies are depending less on recruiting (from a manpower market that hardly exists) to ease the engineer shortage. They're freeing their own engineers from details, improving communications, taking every step to increase individual productivity"[15]. Here is a program which will contribute to the satisfaction of present employees at the same time that it helps the company solve its problems. To overlook this possibility—while centering attention upon improved selection and training of new engineers—is to sacrifice golden opportunity for combating influences conducive to low morale among engineers while simultaneously increasing the efficiency of the company.

The "ideal" program which I have described is not one which is operating in its entirety in the Philadelphia Electric Co. In some respects, the four-point program embodies the views of a "specialist" who may have perhaps allowed an academic frame of reference to draw him away from the practicalities of the situation. However, it is my feeling that this is both a practical as well as a theoretically sound program for the initial training and for the development of engineers at all levels.

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By M. FRANK KNOY
Boston (Mass.) Consolidated Gas Co.
and
JOHN L. TURNAN
Worcester (Mass.) Gas Light Co.

LOAD FORECASTING

using the "normal weather pattern"

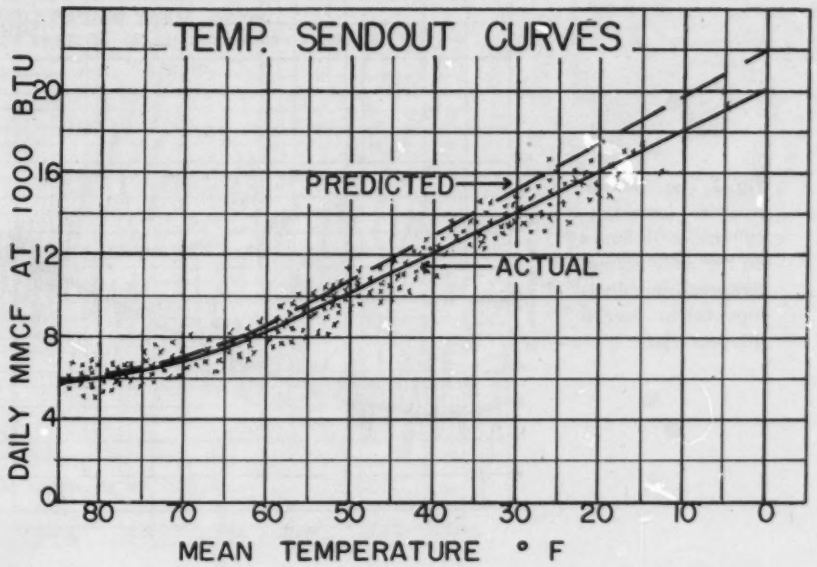


Fig. 1. Size of connected load and behavior in response to weather may be determined by plotting the temperature sendout curve.

Load forecasting is primarily a local affair, and readers of conventional articles on the subject will seldom find much information that can be profitably applied to their own operations. In this study, however, a relatively simple method is described—one that can readily be adapted for use by other utilities in other areas far removed from Massachusetts.

●

WHETHER a gas utility company derives its supply from a natural gas pipeline, or a combination of pipeline and other production facilities, the determination of peak day demand and probable annual sendout for the coming year is a requirement for efficient production planning.

The maximum daily sendout and the annual total for all gases used will be determined by two factors as follows:

A. The size of the connected load and its behavior with regard to temperature variations.

B. The normal weather pattern and the normal temperature duration curve for the area in question.

The size and nature of the connected load

The temperature sendout curve. The size of the connected load and its behavior in response to weather conditions may be determined by plotting the daily sendout versus the daily temperature for the preceding July 1 to June 30, as indicated in *Fig. 1.* The median line drawn through the band of temperature-sendout points is called the temperature-sendout curve and represents the average sendout experienced at various temperatures.

It will be observed that there is considerable scatter of individual daily sendout above and below the median line. The variations below the line are due to such factors as weekends, holidays, and even days of bright sunshine and no wind. Variations above the line are due to such factors as precipitation, high winds, days of the week, etc.

All such deviations from the median curve, however, tend to wash out over the yearly period and may therefore be disregarded in using the curve for annual load forecasting.

If a temperature sendout curve is to be used for daily sendout predictions one must naturally weigh the causes of deviation from normal load mentioned above and make his day-to-day load predictions accordingly.

The scatter shown on *Fig. 1* is rather wide and is perhaps exaggerated to emphasize the fact that it exists. Some scatter will be found in any utility system and it is up to each of us to determine the temperature sendout behavior of his particular gas system.

Expected temperature sendout curve for the coming year. In a growing utility system the temperature sendout curve for the previous year cannot be used to predict exactly the load for the coming year. It is, however, a necessary point of departure for drawing the expected temperature sendout curve for the following year.

To derive the expected load at various temperatures for the coming year, one may obtain information from the sales department as to new base load connected and new space heating load connected. If now the new summer load is added to the old, at say 70° F, and the new peak day load added to the old, at say 0° F, an expected temperature sendout curve is derived similar to the broken line on *Fig. 1* by connecting the expected summer load and the expected peak day load by a line drawn symmetrical with the old temperature sendout curve at all points.

This then is the expected temperature sendout curve for the coming year. It may be used for day-to-day load predictions, by using the scatter factors mentioned above. In combination with a temperature duration curve for the region, it may be used to predict the next year's sendout and the size of the peak day for any given minimum temperature.

This temperature sendout curve is a rather wonderful tool for the gasman, considering its simplicity. Regardless of whether your data for it were plotted from an extremely cold year or an unusually warm year, the path of the median line would be identical in either case. It is true that a cold winter would give many more performance points at the

This article is adapted from a talk presented at the Jan. 20 meeting of the NEGA operating division in Boston.

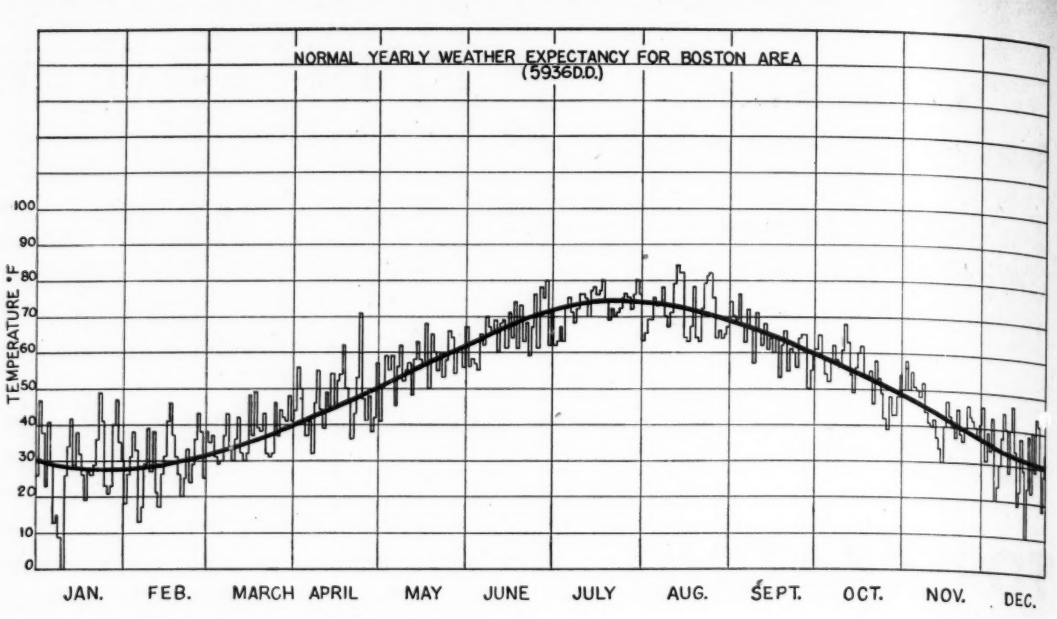


Fig. 2. The "normal weather expectancy" curve is based on the daily normal temperature readings taken over a 50-year span.

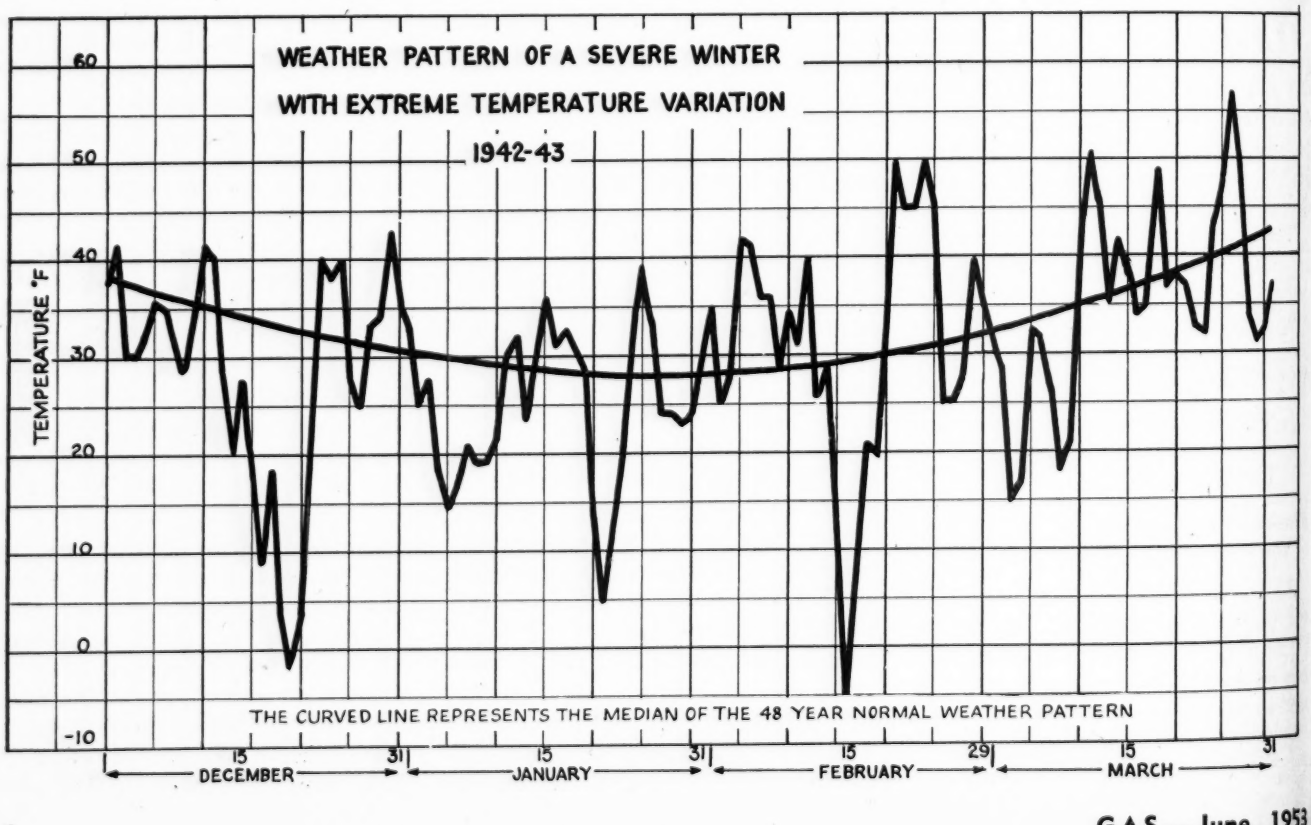
right hand end, say, between 30° F and 0° F. A warm year would give much fewer points for plotting in this region. But the path of the median line would not be altered. Hence, one may at the end of any heating season plot the temperature sendout curve for his system for the preceding year and know that it accurately represents the size and the weather response of the connected load.

Normal weather pattern. From the nearest U. S. Weather Bureau one may obtain the 50-year normal temperature for each day of the year and plot it as in the smooth curve on *Fig. 2*.

Since this normal temperature curve represents only average temperature for any given day, a true weather expectancy must be derived by showing a weather pattern such as the zig-zag graph on *Fig. 2* reflecting the temperature variations above and below normal commonly experienced in the area in question. This can be done by studying actual weather patterns for a number of years, and superimposing a typical weather pattern upon the normal temperature curve as shown in *Fig. 2*. Here we have taken pains to construct the weather pattern so as to reflect the correct average number of degree days for each month of the year (see *Table 1*). At the same time we have shown day-to-day temperature variations just as they normally occur.

In studying a number of years in order to get a typical weather pattern, we ran across a few rather extreme deviations from the normal, as would be expected. The winter weather pattern for 1942-43 is shown on *Fig. 3*. As will be seen this was an unusually cold winter, with the temperature well below normal most of

Fig. 3. A few extreme deviations from normal weather pattern may be expected, as shown on this winter weather pattern for 1942-3.



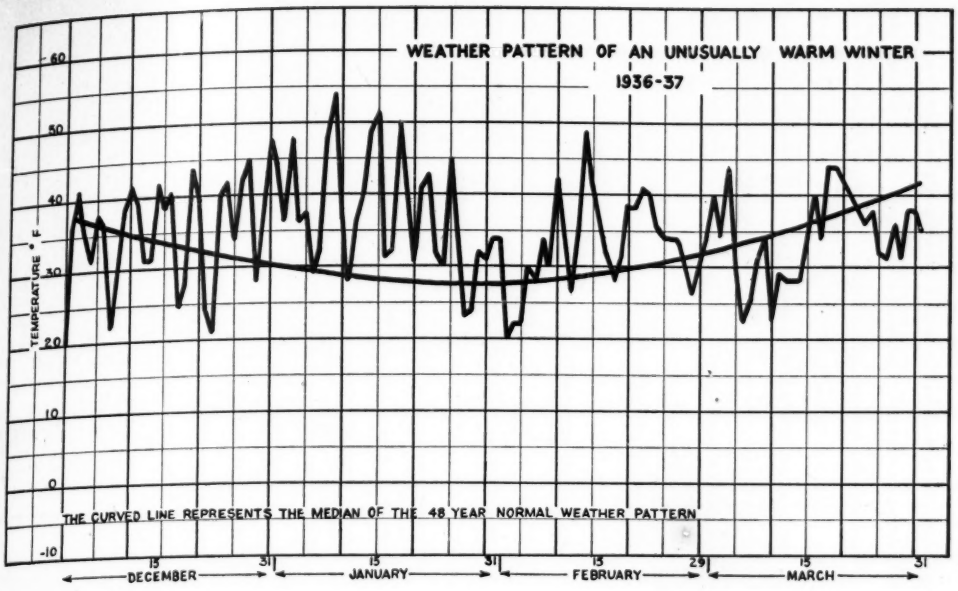


Fig. 4. Extreme deviation on the warm side is reflected in this pattern for 1936-7.

the time. The coldest day averaged 8° F below zero in Boston and somewhat colder in the suburbs.

Fig. 4 gives the winter weather pattern for the very warm winter of 1936-37. Here the coldest day was 18° F and the temperature remained above normal most of the time.

Deriving the temperature duration curve and the annual load duration curve. A typical yearly weather pattern, as shown on *Fig. 2* having been derived, a tabulation was then prepared showing the number of days reaching 0° F, 10° F, 20° F, 30° F, etc., from which a temperature duration curve was plotted, as in *Fig. 5*.

This curve shows how many days will normally occur of a given temperature or colder. For any given temperature the predicted temperature sendout curve, *Fig. 1*, will give the predicted load. If such load predictions are plotted for 10-day intervals for the year, a predicted load duration curve such as shown on *Fig. 6* is derived.

The wonderful thing about the annual load duration curve when so drawn is that the area beneath it represents to scale the total predicted annual sendout. For example, each of the squares with heavy borders on *Fig. 6* represents 20 MMcf of sendout. By using graph paper of a proper scale one may planimeter this area directly or it may easily be broken up into a series of rectangles and triangles whose areas are then calculated and totaled. Another method is to read the height of the load at 10-day intervals, determine their average, and then multiply by 365 to get the yearly total. It should be noted at this point that the expected load duration curve was plotted for a normal year. It will therefore be somewhat amiss if the coming year proves to be abnormally cold or abnormally mild. However, *Fig. 7* shows how a given gas system would have performed for a normal year or for a warm year such as 1936-37, or for a cold year such as 1942-43. This should reassure the forecaster that if he bases his predictions on a normal year the occurrence of an abnormal year will not throw his calculations out alarmingly, and for those years that deviate only a little from normal his predictions should be very close.

Costing the predicted year

One function of load forecasting is to enable the manufacturing department of a utility company to budget manufacturing costs for the coming year and to provide the fuel stocks and other materials that will be required for peak shaving purposes. Incidentally, it will also make it possible to judge as to the adequacy of standby facilities.

Having drawn the predicted annual load duration curve as suggested above, the production engineer is able to block it off into areas of base gas and peak shaving gas or gases. The annual volume of each component gas may then be determined by planimeter or by computation.

The annual cost of each component is then derived by multiplying the volume thus determined for each by its estimated unit cost.

Fuel stocks required for peak shaving gases may also be determined from the annual volume indicated for each.

TABLE 1. MONTHLY NORMAL DEGREE DAYS (BOSTON AREA)

Month	Normal Degree Days
January	1108
February	1025
March	841
April	538
May	245
June	66
July	7
August	15
September	98
October	338
November	647
December	1008
Total	5936

Conclusions on annual load forecasting

To summarize the objectives of this brief study, we have sought to set forth the following points:

A. The temperature sendout curve is a reliable index of what a system load will be at any given temperature.

B. The local weather pattern based on 50-year normal behavior is an excellent long range weather forecast for purposes of predicting monthly or annual sendouts.

C. Given a predicted temperature sendout curve and a normal weather pattern, one may construct a predicted load duration curve depicting the annual sendout with reasonable accuracy.

D. Base gas and peak shaving gases may be blocked off on the load duration curve. Each component gas may then be costed on an annual basis, and the raw materials for manufacture of peak shaving gas may be determined.

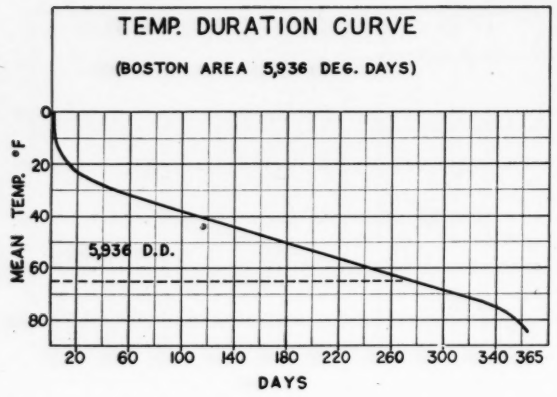


Fig. 5. Temperature duration curve shows how many days of a given temperature, or colder, will occur.

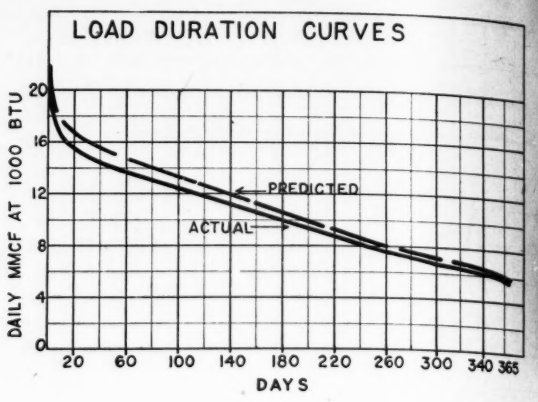


Fig. 6. Load duration is predicted from load predictions plotted for 10-day intervals for the year.

Application of load forcasting methods at Worcester

With the completion of the foregoing study and its detailed curves, the daily sendouts can be predicted for the operating personnel. One of the first requirements for accurate use of such data is a reliable source of weather forecast for the area concerned either as the daily average temperature or the degree day, including wind velocities for at least a three-day period. In our particular case we receive a three-day forecast in degree days from the U. S. Weather Bureau in our district that has been consistently accurate.

Prediction of sendout and presentation to the foremen. We have grouped our daily sendouts into three periods of the week. Statistically, Saturday and Sunday are placed into one group as our large industrial load is shut down on weekends. The second group consists of the normal days of Wednesday, Thursday, and Friday. Monday and Tuesday make up the third or largest sendout group due to the pick-up of the industrial load and wash days.

When the three-day forecast is received, the sendouts are obtained from the appropriate graphs. From experience, the volume due to wind velocities can be added. These predictions are posted on the bulletin board in the foreman's office. The previous year's daily sendout and degree days are also posted for comparison and possible refinement. As the weather report is received every day for a three-day period, any corrections to previous forecasts are reflected in the sendout predictions.

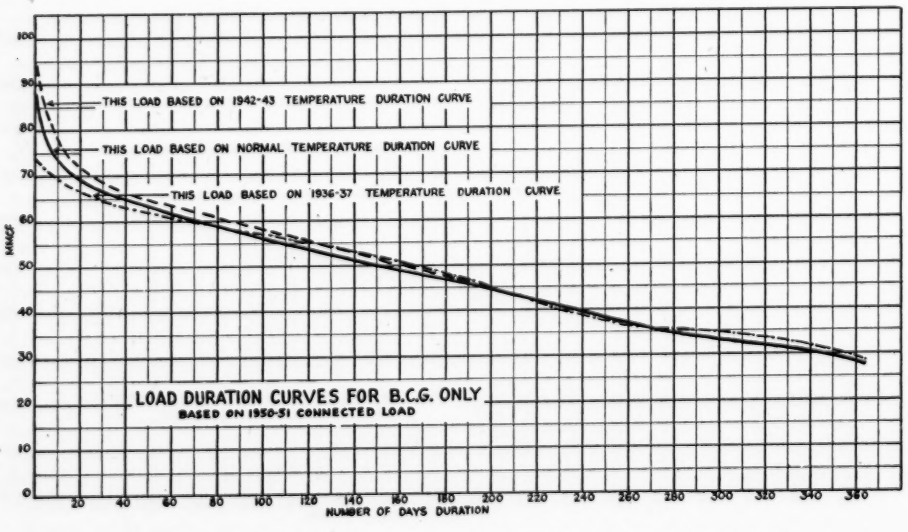

THIS LOAD BASED ON 1942-43 TEMPERATURE DURATION CURVE
THIS LOAD BASED ON NORMAL TEMPERATURE DURATION CURVE
THIS LOAD BASED ON 1936-37 TEMPERATURE DURATION CURVE
MMCF
LOAD DURATION CURVES FOR B.C.G. ONLY
BASED ON 1950-51 CONNECTED LOAD
NUMBER OF DAYS DURATION

Fig. 7. Comparison of load duration curves of extremely abnormal years with normal years indicates that limits of load deviations are actually minor.

Observation of hourly sendouts and temperatures. An outside weather temperature recorder and a recording natural gas flow integrator are read every hour. If by experience the actual hourly values are not in agreement with these predicted, alterations are made to the latter.

From the economic study the point above which peak shaving occurs can be determined. It is, of course, this maximum daily quantity that the foremen endeavor to maintain. For practice purpose during the 1952-1953 season, we peak shaved all over 10 million per day. This equals about half our heating load.

Methods of peak shaving. At the Worcester plant, we have four methods of peak shaving, using the holders, the propane-air plant, the oil gas plant, and interruptible.

If the prediction for the three days is slightly over 10 million each day, gas may be taken from the holders. This applies especially to Thursdays and Fridays for the loss can usually be made up on Saturday and Sunday, due to the drop in the industrial load. If it is to be a slightly higher peak for two or three days and does not warrant starting the oil gas plant, propane-air may be used. If an extended period of peak shaving is predicted, oil gas can be made. The holders and propane air plant are generally used in the early fall or spring. The interruptible customers can be shut off as a last resort to avoid passing the maximum daily quantity.

Follow-up of predictions. Constant comparison of the actual and predicted sendouts and study of the variables concerned tend to make future predictions more accurate. Close cooperation between all branches of sales, especially the industrial, should be maintained. In this way, adjustments can be made to predictions for any change in sales.

Across the page: Groups at the distribution conference: Here (l. to r.) are J. A. Whelpley, Cincinnati Gas; P. W. Rogers, Ohio Fuel; and W. J. Kretzchmer, Columbia Gas.

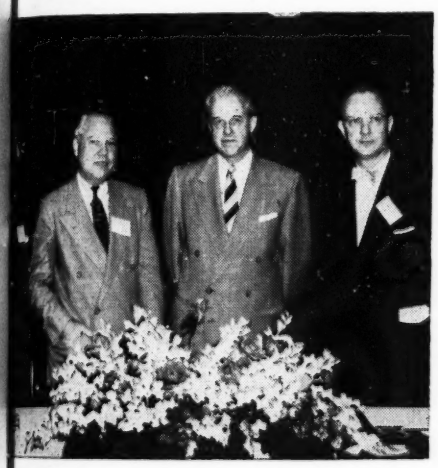
P. W. Geldard (left), Consumers Gas Co. (Toronto), chats with J. M. McCaleb, Columbia Gas. They are vice chairman and chairman, respectively, of the distribution committee.

W. H. Weber (left), Brooklyn Union, has attentive listeners in Consolidated Edison group. From left they are F. G. Sandstrom, J. J. Gagen, and E. G. Watkins. (Story on page 68.)

Conference camera

The mass migration of top-level gasmen from one conference hall to another during the spring months is an annual phenomenon. Represented on this page are a round half-dozen of the two-score meetings of national and regional import held throughout the nation in April and May. (For brief reports of the highlights of these meetings, turn to the "Associations" department beginning on page 68.)

In Philadelphia for industrial sales conference were J. Fred Vollmer, Stouffer Corp.; Roy E. Wright, NEGEA Service Corp.; and R. S. Chapman, Atlanta Gas. (Story on page 70.)



Left: Incoming and outgoing officers of Indiana Gas Assn. From left: E. M. Hahn, Kokomo Gas, retiring president; J. C. Sackman, Northern Indiana, president; E. G. Peabody, Citizens Gas, vice president; and V. C. Seiter, Citizens Gas, secretary-treasurer.

Right: Mrs. C. E. Holmes, wife of C. E. Holmes of Natural Gas Pipeline Co., receives one of 225 orchids presented by Whirlpool Corp. at Midwest sales convention. (Story on page 72.)

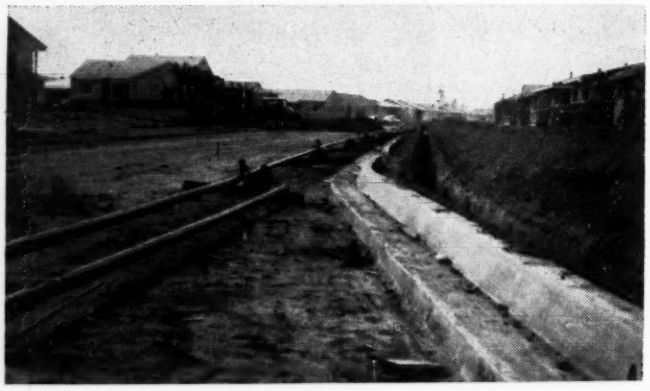
These chairmen presided at 5th national personnel conference in Chicago. They are H. M. Rogers, Texas Eastern; G. W. Fewkes, Philadelphia Electric; J. J. Solon, Peoples Gas; K. R. Boyes, AGA secretary; D. A. Hardesty, Natural Gas Pipeline Co.; and L. A. Brandt, Peoples Gas. (Story on page 73.)

Speakers at purchasing and stores conference were (front) D. B. W. Brown, Milwaukee; C. W. McVicar, Rockwell; J. C. Sims, Brooklyn; Pat H. Butler Jr., Washington Gas. Back row: A. E. Altenhofen, Milwaukee; L. R. Michelsen, Peoples Gas; G. H. Smith, AGA; P. E. Ewers, MichCon. (Story on page 68.)

Money-savers

By **R. E. HAUN** • Southern California Gas Co., Los Angeles

Time and money can be shaved from distribution construction projects through close cooperation and careful planning with both contractor and subdivider when a gas utility is laying mains and services in a new tract. Continuing studies we have made in the southern division of Southern California Gas Co. at Compton have pointed to improvements in methods which can achieve not only material savings but better relations with subdividers and the public as well.



Main with pipe and tees welded, tested, and coated ready for installation as soon as trench is opened.

Separate main and service installations

Timing is a vital factor to all concerned in this work, since there are so many phases of subdivision construction which must be coordinated—the street grading, sewer and water main installations, curbs, driveways and street paving, and the building construction itself. In our studies, we have found that by separating main installation work from service installing in larger tracts we can speed up the jobs and improve our relations with the subdivider.

In brief, the procedure is as follows:

1. A definite working schedule including the time of starting work, point of beginning, and rate of progress to be made is prepared jointly with the tract superintendent.

2. A separate crew for installing mains is organized, sized to meet the schedule laid out. The crew's job covers trenching, testing, field coating of welded joints, and complete backfilling.

3. One or more separate crews are organized to handle the installation of services, of a size and so equipped as to be able to keep up with main construction work schedule.

This plan has several distinct advantages in that the blocking of streets to construction traffic is kept at a minimum. When the main is laid, the parkways and part of the center of the street are kept open to traffic. When the services are installed, the work may be done by installing them on one side of the street at a time, leaving the balance of the street open to traffic. Trained crews, supported by sufficient trenching and backfilling equipment, are able to maintain uniform installation schedules, completing regularly as much as 2500 ft of main and 100 services per day.

Service connections

The widespread use of plastic piping for services in many of the new subdivisions permitted some modifications to be made in installation practices. Welding of Dresser service tees to the mains was possible while the mains were still on skids over the open trench. Testing and field coating of the service tee connections were then completed while they were still over the trench, with a blank steel washer and gasket fitted into the tee outlet of the coupling.

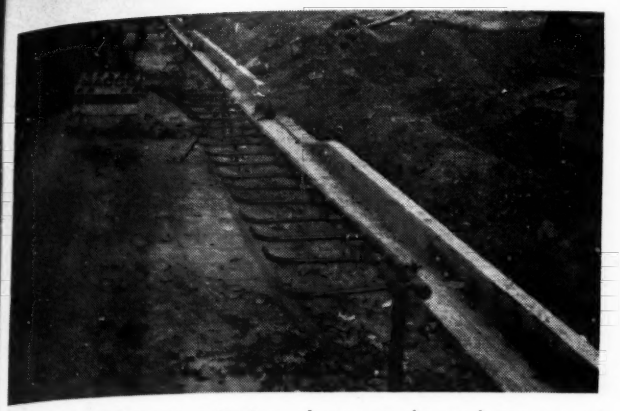
This practice eliminated the need for bellholes, with the attendant difficulty of applying the coating in a narrow trench or bellhole. Plastic services were connected to the tees after the main was lowered into the trench.

Main being lowered into trench immediately behind trencher ready for clock test and backfill.

Coating of service riser bends

While we have been installing a great many plastic services during the last two years, we still use steel risers. Some of our contractors have prepared manifold jigs that can be used to coat as many as 20 riser bends at a time. In some instances these have been coated in the contractor's yard but in general their work has been done in the field, using our standard meter pipe manifold to which the risers are at-

This article is adapted from a paper presented at the PCGA distribution conference, April 28-29, in San Jose, Calif.



Riser manifold for installation of stop cocks and coating of riser bend. (Meter manifold is adapted as jig for this job.)

tached for treating. The manifold is clamped to "A" frames of convenient work height for coating application.

Coating holiday survey

In order to insure that our coated pipe has been protected in handling and backfilling, we use a Pearson holiday detector to make a survey of the installed coated pipe immediately after backfilling. The instrument detects minute coating damage so small that it could be pinpointed, in

Holiday detector transmitter with battery hookup to main through line valve.

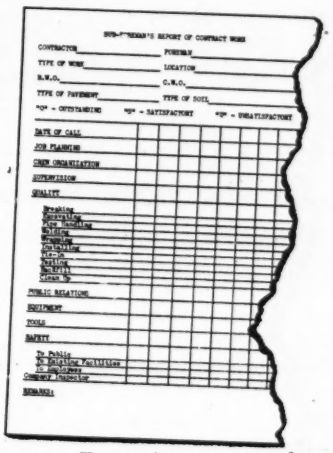
some instances, only through the use of a brush-type holiday detector when the pipe was exposed.

This survey not only disclosed damaged coating, but revealed some omission of the coating of field joints, contact of our pipe with foreign substructures, and a weakness in our present coating of service tees with which we are still

Holiday detector crew testing over recently flooded and tractor-packed trench backfill.

concerned. Moreover, the holiday survey has a definite psychological value, because it impresses the contractors' employees with the need for careful workmanship since the repair of damaged coating is expensive, whereas little additional cost is required initially to avoid damage or omissions.

Quality control of contract work



In the interest of obtaining improvement in construction work of our contract crews, the company has adopted an incentive work program. Briefly, this program is directed at the management and employees of the contractor as a means of increasing the quality and quantity of their work through the offer of increased allotment of work based upon their individual and over-all performance. Errors in paper work and accounting for material are also recorded. To obtain a measure of both the quality and quantity of the field work and other factors which affect the contractor's performance, standard measurement of the work is required and the following practices have been adopted:

1. On cost-plus work, production performance of field crews is measured in relation to standards which have been developed through time studies.
2. Pipeline construction inspectors check in detail the workmanship of both cost-plus and bid work. Inspection results are reported on a uniform check list, which enables us to compare the performance of the contractors on a system-wide basis. Samples of these work sheets are shown.
3. Periodically, summaries of the over-all performance of contractors and ratings of individual foremen are prepared, based upon field observations, reports of subdivisions, home owners and the travelling public.

Pipeline contractor employee training

It is felt that our pipeline construction contractors are cooperating fully in our incentive program and are making special efforts to improve their work performance through improved field supervision and thorough training of their employees. (See sample training booklet inset.) Most of them hold regular employee meetings to discuss field problems and some are conducting special training courses in not only field practices, but in job safety, public relations, work planning, supervision, and some use training courses similar to those adopted by the gas company in its own training program. In some instances, the contractors have invited company people to attend their employee meetings to improve relations and to present programs describing pipe coating, job training, etc.

What a customer service representative, a home service director, and a retail appliance manager want in gas appliances was the subject of a panel at the recent research and utilization conference. Panelists were (l. to r.) J. G. White, Peoples Gas Light & Coke; Mrs. M. L. Bohn, Laclede Gas Co.; Moderator G. M. Nash, Central Hudson Gas; and J. W. Ferry, the May Co., Cleveland.

"Here's what I'd like to see in gas appliances and servicing ..."

". . . top range burners designed for easier cleaning."

Mrs. Bohn gave the viewpoint of the home economist.

I would like to have:

1. Hot water heaters with remote controls so that the housewife could change the thermostat setting without going down into the basement.

2. Hot water heaters with dual temperatures similar to the unit now available, which is rather expensive.

3. Hot water heaters with separate small high temperature gas units to heat water for special tasks such as is necessary at dishwashing time with a dishwasher.

4. Single unit combination clothes washer and gas dryer for the home with limited kitchen or utility room space.

5. Gas clothes dryers that will dispose of lint and moisture in a more efficient manner.

6. Gas clothes dryers that will open on the top instead of the side to eliminate unnecessary stooping when removing clothes. Older women particularly dislike this feature about automatic dryers.

7. Gas incinerators in attractive enamel enclosures so that home owners could place them in the kitchen or nearby utility room. This appliance could prove to be a big competitor to the electric disposal which disposes only of food, not rubbish.

8. Gas furnaces that will be as silent as the gas refrigerator. Some of the present installations are a little noisy.

I think too little progress has been made by gas range manufacturers on top burners, particularly as regards ease of cleaning. Anyone who has ever tried to clean the surface burners and intricate gas pipe below the top burners of a modern gas range knows it requires several hours of work, the patience of an angel, a strong detergent, and after the battle is over, a good manicure. If this endurance contest does not take place at least once every week, the grease and debris accumulate and the ordeal becomes a major operation.

One of our foremost range manufacturers has designed a one-piece top burner unit which is porcelain enameled inside and out to prevent rusting and which lifts out all in one piece for easy washing. The two burners are combined into one piece, and the burner heads are fastened securely to the burners. This unit is one of the easiest gas range top burners on the market to clean for that once-a-week renovating, but it still is not as easy for daily clean-ups as the top burners of our competition.

Some gas ranges do not have a cover over the pilot light which is located in the center of each unit on several models. A quick swish of a damp cloth to vanish spillovers can also mean a quick unexpected burn on the hand from the heat of the pilot light. Such details as top grates that fit into grooves would be more convenient to raise and lower if they were attached by hinges.

". . . application of servicing experiences to appliance improvement."

Mr. White gave the viewpoint of the customer service man.

From a service point of view, the improvements I would like to see in gas appliances fall into two general categories:

1. Those improvements (in design and use of best quality materials) which will provide the utmost in safety and performance with a minimum amount of services being required during the normal life of the appliances.

2. Those improvements (in accessibility) which will permit the serviceman, when he is called in, to perform the necessary services with a minimum of difficulty and time.

In the list of domestic research and utilization bulletins and reports which appeared in the 1952 utilization conference program, I failed to find any projects listed which arise out of studies of underlying causes for service calls, the frequency of calls on one type of equipment as against another, or easy accessibility and serviceability of those parts which require periodic adjustment.

The customer service organizations of the gas industry are making hundreds of thousands of calls every year to the homes of customers for the purpose of rendering some kind of service on their gas appliances. For the purpose of objective analysis, we will divide the causes

for these calls into two general categories to include:

1. Those which are a direct responsibility of the utility because of changes in gas composition, gravity, pressure (including peak load operation), etc.

2. Those which are of a repetitive nature and are traceable to the design of the appliances or accessories.

It is reasonable to believe that out of these hundreds of thousands of service calls there is a reservoir of factual data which, if properly assembled, analyzed, and channeled, could prove of great value to those engaged in the study of appliance research and development.

The question then is whether the experience obtained in the appliance servicing field is properly used to develop improved appliances. The best way to find out, of course, is to make a thorough investigation. How this could best be done would be to have each utility provide orderly communication between its research and utilization activities and the appliance servicing activities, and then let the utilization engineers of the utility industry talk out the problem with the appliance manufacturer's design engineers.

". . . changes in manufacturers' design and service policies."

Mr. Ferry gave the viewpoint of the retailer.

Retailers believe that certain changes in manufacturing, merchandising and marketing are required to meet the competitive situation existing at this time. To improve our over-all position, the following suggestions are given:

1. We recommend that more manufacturers standardize their lines permitting greater flexibility.

2. We believe that the manufacturer should shorten his line, not to exceed 10 models, and that each franchised dealer should be expected to carry the full line on his floor at all times; for how can we expect to accomplish a merchandising position when the dealer shows but one or two models of his line.

3. Manufacturers must recognize the increased costs of delivery and installation in certain areas and should establish their retail prices by zones if possible.

4. Should the trade-in become an integral part of our future merchandising plans, our margin should be increased to permit a trade-in allowance, for I think it is important for the health and welfare of the gas appliance industry to scrap most of the old type ranges that would be taken in on trade and not put them back into the field.

For economical use affecting delivery and service of gas ranges we suggest the following:

Economy: Gas ranges should leave the manufacturing plant fully equipped and assembled with a gas pressure regulator and regulator should be rechecked. Improved secondary air distribution should be provided for top burners to effect better combustion without having top burner grids set as high above range top as they are at present. Oven heat distribution should be improved to insure better baking results.

Health: Careful consideration should be given to component parts so that they may be removed easily for cleaning; to ease of oven bottom removal for cleaning; and to improved boiler efficiency. Two-piece black broiler should be eliminated on all ranges except at the very low price end. We prefer reflective type (chrome, etc.) broiler lining.

Insulation: Careful consideration should be given to the increased efficiency of the oven and broiler insulation. Reduce heat at the back of range for compact installation. Today's small kitchens require additional insulation in most ranges.

Comfort: Since today's kitchens are more compact, we receive considerable complaints because of the heat generated by continuous use of the range. Careful consideration should be given to the expanding of a single point gas or electric ignition. This will keep small kitchens from heating when the range is not in use.

Convenience: Smooth operating leveling mechanisms should be standard on all ranges for easy adjustment and cleaning, for leveling is one of our greatest complaints from our customers. We would like to see graduated click valve or similar settings of three-fourths, one-half and one-fourth of full input ratings for all top burner valves, in addition to the present thousand and one, simmer and keep warm positions. Many of our customers ask if these electric range features can be made available on gas ranges.

All ranges should have built-in lights for top work surface, and waist-high broilers, and large precision ovens.

Pride of Possession: Modern ranges require simplicity of design, easy cleaning and plain simple lines. Transportation and storage have created a problem with regards to the cleanliness of all appliances today, and particularly gas ranges, for the filth, dirt, and grime of warehousing permeates the entire range.

We suggest that the entire industry adopt a paper bag to cover the entire appliance so that when it is taken into the customer's home it is like the product seen in our showroom.

Service: As retailers, we would like to have the manufacturer and the utility furnish us in writing what they consider to be the fundamentals of a good installation.

We would like to see a clean range, oven leveled, top burners checked and pilots adjusted, so that burners light automatically. Oven thermostat should be calibrated to give the best results from date of installation; oven and broiler should be checked for correct gas input. Customer should be instructed in the care and use of the range.

This total installation may be prohibited in regions such as ours for it requires two men and a truck to effect delivery. The time consumed in calibrating the oven would perhaps be too costly; however, we feel that if this cannot be done as previously suggested at the manufacturer's level, then something must be done to keep this cost within reason during installation.

We think the following suggestions should be given serious consideration by the dryer manufacturer:

1. Lower temperature type dryers with greater velocity of air in vent-types. This type will be required because of the new miracle fabrics which are fast becoming a larger part of the home laundry load.

2. Easier access to lint traps, and also easier accessibility in loading and unloading clothes.

3. Unexposed heating elements to eliminate odor of scorch burn from flying lint.

4. Lower competitive prices—gas versus electricity.

5. Simplified humidity control on non-vent type dryers.

6. Porcelain finishes, or at least porcelain top, for work table surface.

7. Flush wall mountings.

8. Easier accessibility to gas burners for cleaning purposes.

9. Stainless steel interiors in the tumble drum, thus permitting greater reflection of usable heat at lower temperatures.

10. Solid drums in preference to perforated type, when clothes make contact with drum and baffles.

TABLE 1. FREE SERVICE VS CHARGES
(Compared By % of Total Reporting Meters)

	Free Service by Utility	Charge for Service by Utility*	Charge for Service by Others
Range			
Burner adjustment	83.5%	16.0%	0.4%
Control adjustment	78.4	21.0	0.4
Lubrication	75.0	21.8	3.1
Water Heater			
Burner adjustment	84.7	14.6	0.4
Control adjustment	82.0	17.4	0.4
Lubrication	75.3	19.8	4.5
Cleaning flues and burners	58.5	24.6	16.6
Refrigerators			
Burner adjustment	79.5	15.7	4.5
Control adjustment	73.7	17.8	7.7
Cleaning flues and fins	49.5	34.4	15.2
Central Heating			
Burner adjustment	81.4	18.0	0.4
Control adjustment	77.7	19.8	2.2
Lubrication	71.0	19.4	9.5
Periodic clean out	27.0	24.2	47.8

* Includes 2% (approximate) whose charges are higher than cost.

TABLE 2. REPAIR AND REPLACEMENT OF PARTS
(In % of Total Reporting Meters)

	Free Repair and Replacement	Repair & Replacement at Cost or Less by Utility	Repair & Replacement Higher Than Cost by Utility	Repair & Replacement by Outside Agency
Ranges	17.8%	37.5%	17.5%	27.2%
Water heaters	19.0	44.6	17.2	19.0
Refrigerators	10.9	46.4	24.7	23.0
Central heating	4.5	36.4	17.4	40.0
Floor and wall furnaces	4.7	39.3	16.2	40.1

TABLE 3. SERVICE POLICIES WITH RESPECT TO DEALER SALES AND WARRANTY EXPRESSED
(As % of Utility Companies Who Service Appliances)

	Servicing Done on Appliances Sold by Others	Servicing Done In Warranty	Servicing Done Out of Warranty
Ranges	99.3%	80.4%	99.2%
Water heaters	98.1	81.4	97.2
Refrigerators	97.1	83.3	97.5
Central heating	99.0	72.0	97.0
Floor and wall furnaces	97.3	71.5	97.2

TABLE 4. INSPECTION AND STANDARDS
(By % of Total Reporting Meters)

	Ranges	Water Heaters	Refrigerators	Central Heating Equipment	Floor & Wall Furnaces
New Installations					
a. Own installations inspected by gas company	59.9%	51.8%	58.8%	40.4%	40.3%
b. Installation by others inspected by gas company	21.2	35.6	38.5	55.9	52.0
c. Installations specifically covered by city code	32.0	55.6	30.7	52.3	48.2
Does your company prescribe					
a. Minimum equipment standards beyond AGA approvals	11.2	18.0	12.3	34.2	23.8
b. Minimum installation standards	70.9	76.8	77.5	77.0	68.7

Utilities ... of having ...

By C. GEORGE SEGELER
American Gas Assn., New York

THE check lists on customer service policies and practice which the AGA committee on customer service responsibility sent out to member companies to establish a foundation for the committee's work have now been analyzed, and the high degree of response clearly indicates the interest of utilities in the problem and the need for the data as a basis for committee proposals.

From these replies the committee has been evolving a "Statement of Good Practice in Customer Service," which is outlined on page 46.

The unusually high response—96% of meters of AGA members are represented with complete responses despite the more than 400 points included in the check list—shows a great similarity in policies among members. Since these were independently arrived at by several hundred member companies, it would be logical to conclude that they are sound—that they meet the needs of the customer, are economically feasible, and are acceptable to the utility commissions.

The survey covered service policies for all of the commonly occurring customer requests such as burner and control adjustments, lubrication, cleaning flues, turn on-turn off, and parts replacement or repair. The equipment for which this information was secured included ranges, water heaters, refrigerators, central heating units, floor and wall furnaces, room heaters, commercial and industrial appliances, as well as customer owned piping. This was supplemented by questions on standards, codes, and inspections. Furthermore, gas companies were asked to indicate whether service was "free," "at cost" or "higher than cost" and how this was affected by the questions—who sold the equipment, and was it in or out of warranty?

In summarizing replies, the commit-

This article is adapted from a paper presented at the distribution, motor vehicles and corrosion conference, April 13-16, in Chicago.

recognizing the wisdom ... und servicing policies

TABLE 5. SIGNIFICANCE OF INSTALLATION INSPECTIONS

	Ranges	Water Heaters	Central Heating	Floor & Wall Furn.
a. Per cent sold by gas company	13.0%	13.7%	5.0%	4.4%
b. Per cent of "a" inspected by gas company	59.9	51.8	40.4	40.3
c. Per cent sold by dealers	87.0	86.3	95.0	95.6
d. Per cent of "c" inspected by gas company	21.2	35.6	55.9	52.0
e. Total per cent of all appliances inspected	26.1	37.8	55.2	51.5

tee tabulated them on the basis of meters represented as well as on a numerical company basis. What we have learned is incorporated in the tables and analyses on these pages.

Analysis of Table 1: These findings confirm the generally held opinion that nearly all gas companies recognize the need for rendering this work themselves. More than 80% of all customers receive service on burners and controls without charge. Where charges are made, they vary from "below cost" to "cost," with 2% charging "above cost," although remarks indicated there was a difference of opinion as to what constituted their service costs. It was generally agreed that service should be rendered promptly.

Lubrication, cleaning, etc., are services for which customers in increasing percentages must look elsewhere, and for which utilities that do the work are charging in increasing numbers. The low percentage of meters receiving free cleanout service for central heating equipment suggests that this job may not be required in natural gas areas. There are few such installations in southern sections.

A somewhat surprising number of meters are also receiving free periodic inspections independent of calls from customers. As a percentage, the number receiving such service for ranges, water heaters, and refrigerators is insignificant, but the fact that the service is rendered at all is of interest.

With central heating equipment and floor furnaces, however, 25% of meters receive a free periodic cleanout. These are in manufactured gas areas, where the nature of the gas demands it. From 6% to 9% of all meters are given free periodic inspection of heating equipment for such work as burner and control adjustment, lubrication, etc. Further analysis may show that this service is rendered in highly competitive situations.

Analysis of Table 2: While a substantial percentage of companies turn the work over to outside agencies, and a majority who perform the service make charges for parts, nevertheless the general thinking is in keeping with the policy of making gas appliance service available at minimum expense, since two out of three customers can secure this work at cost or less.

Analysis of Table 3: Regardless of who sells an appliance or whether it is out of warranty, most companies accept the responsibility for servicing gas appliances. Generally, it was found, companies giving free service made it available without respect to either warranty or seller.

Analysis of Tables 4 and 5: While a large number of companies and the meters they represent find it desirable to inspect installations before leaving them for customer use, about half of all installations are made without a final check. Curiously, while a majority of ranges, refrigerators, and water heaters bought from the gas company would be checked, only 40% of central heating equipment would be inspected; and, conversely, a majority of heating equipment purchased from a dealer would be inspected, but only a minority of the other appliances.

As for supplementary standards beyond AGA requirements, 65 companies (or one in four) representing about one-fourth of total meters responding have such requirements for central heating equipment. About 40 companies have special standards for the other major appliances, but these represent only about 12% to 15% of meters.

The relatively high response to the question, "Does Your Company Prescribe Minimum Installation Standards" seems a natural conclusion from the similar high response to the question on inspection by the gas company of appliances sold by the gas company. However, any interpretation of the answers leads to the conclusion that the limited coverage of appliances by city code and the limited inspection of appliances sold by dealers leaves this a fruitful area for additional coverage. The benefits of such work should be greater safety and greater acceptability of gas because the installations will be in better working order and will be properly set up to do the job which the customer wants done. *Table 4* interprets the answers to questions on standards in percentages.

Table 4 has shown us the extent to which appliance installations are inspected by gas company personnel. When data are translated into percentages of all appliances installed, the numbers are small but significant as illustrated by *Table 5.* In the case of ranges, for example, about 26% of the installations are given such an inspection. The significant point which this information reveals is, why should this work be done at all? To answer that question I have asked a number of gas companies who make such inspections to tell me what their inspectors found and whether such work was: (a) unnecessary or (b) desirable. The answer in each case was that the work was not only necessary but that these gas companies would under no circumstances give up this program. It was necessary, they said, to assure customer satisfaction with the equipment and to prevent unsafe venting practices.

We may then ask ourselves this vital question: What would we find if all installations were given such inspection and what effect would this have on customer acceptance of gas equipment?

To illustrate the numerical levels of what you find in these illustrations, I will cite the case of a large utility com-

Considerations of good service

Responsibilities of the utility:

1. Gas Supplied

Each utility is urged to distribute gas with sufficiently uniform characteristics and pressures as to permit the proper performance and satisfactory operation of appliances throughout the year.

2. Information for Customers

Each utility is urged to inform its customers regarding the extent and character of the appliance servicing which the utility is currently prepared to render.

3. Appliance Adjustment Service

Each utility is urged to provide, upon customer's request, prompt and efficient appliance adjustment service, preferably with the cost of such service included in operating expenses to the extent reasonable and practical. This service should be rendered to all gas appliances meeting prevailing minimum standards of safety, without distinction as to appliance warranty or point of purchase; provided that in the judgment of the utility the appliance can be restored to a proper operating condition. The above does not imply that the utility need be the exclusive agency for providing appliance adjustment service. Where the utility finds improper installations made by others, it is urged either to correct such installations or to refer the customer to an appropriate service agency.

4. Parts Replacement Service

In the absence of adequate service by other parties, each utility is urged to offer at reasonable charges to its customers, parts-replacement service on gas appliances which meet prevailing minimum standards of safety, without distinction as to appliance warranty or point of purchase, providing that the appliance can be restored to proper operating condition. The availability of the necessary parts is the responsibility of the appliance manufacturer or his designated representative.

5. Training of Installation Personnel

Whenever required, each utility is urged to assist appliance manufacturers and their local representatives in the training of appliance installers to conform to local ordinances, building, plumbing, and other codes, in order that gas appliances shall be properly installed, initially adjusted and serviced with replacement parts; and assist them in making field checks to determine the effectiveness of the training program.

Responsibilities of the manufacturer:

1. Appliance Quality

Manufacturers are urged to build appliances of such design and construction that proper performance and operation may be obtained over a normal appliance life with adjustments and parts replacements; and with reasonable accessibility for such service.

2. Replacement Parts

Manufacturers, directly or through their designated representatives, are urged to provide replacement parts and local qualified service personnel for the installation thereof and to have them available promptly to the customer during the normal life of the appliance. But manufacturers should not be called upon to provide replacement parts unless in their judgment the appliance can thereby be restored to proper operating condition.

3. Warranty

The manufacturer should fully and fairly live up to any warranty which he has made.

4. Instruction Materials

Manufacturers, directly or through their designated representatives, are urged to make available to local installation and service personnel adequate and readily understandable instructions so that the appliance may be properly installed, adjusted, serviced and operated and to make available to the customer readily understandable operating instructions.

5. Training Program

Manufacturers, directly or through their designated representatives, are urged to provide, whenever required with the assistance of the local utility, adequate training of local personnel in appliance installation, adjustment and parts replacement, and further with the assistance of the local utility, to make field checks to determine the effectiveness of the training program. In such a training program, the installation information given to appliance installers should conform to local ordinances, building and plumbing codes, and other applicable regulations.

Responsibilities of the customer:

1. Appliance Operation

It is the responsibility of the customer to operate the appliance in accordance with the manufacturer's instructions and with proper care.

2. Notice by Customer

It is the responsibility of the customer to notify the selling agent promptly regarding parts replacement during the warranty period. It is the responsibility of the customer to notify the utility promptly of any abnormal condition of gas service or appliance operation.

pany that sold a total of 14,815 gas appliances in the following categories:

CP ranges	1,473
Refrigerators	3,837
Water heaters	4,817
House heaters	2,318
Dryers	491
Miscellaneous space heaters	1,879
Total	14,815

All of these were given an inspection and 2289 violations of good practice were found requiring attention. What the inspectors found included:

Improper flue connections.
Gas leaks.
Water leaks.
Appliances not level.
Improper location of appliances.
Trapped gas lines.
Electrical wiring defects.
Old materials.
Undersized piping.

Can the industry as a whole afford to ignore such revelations?

During January 1953 random selection of jobs in and about New York led to some choice examples of the sort of thing that is found even in the installations made by utility companies.

In broadest terms, the nature of a utility company does not seem to be a determining factor in the stand taken with respect to gas appliance service policies, as revealed by a company count of the check list responses. On the other hand, when the check lists are studied in detail, there are some marked differences in percentage of companies following certain policies.

A direct comparison of the service policies of straight gas companies and combination gas and electric companies shows that free service is offered by a smaller percentage of the combination companies and the corollary to this is that a higher percentage of combination companies make charges for service. It is curious and rather interesting that the percentage of companies reporting that they turn the service work over to others is not materially influenced by the nature of the utility company. In the case of straight gas companies, from 5% to 10% charge higher than cost for service while 10% to 20% of the combination companies make such charges, depending on which service item is under consideration. There is a consistent pattern of difference but, nevertheless, it is not a large difference and therefore does not seem to be too significant since the majority of gas customers are receiving free service.

Wholesale rate increases under bond threaten distributors' financial position

Stuart John

In recent months, many gas distributing companies have been faced with a disturbing and perplexing problem which might have been resolved several years ago but for the anomaly of gradually decreasing rates, which existed long after inflation began. This problem is the effect of suppliers' rate increases effected under bond.

The growing seriousness of the situation prompted the AGA rate committee to form a special subcommittee headed by Stuart W. John of Commonwealth Services Inc., New York, to study the effects of the section of the Natural Gas Act authorizing bonded rate increases, and to explore possible avenues of relief.

The report from which this article was excerpted comprises the sum of the subcommittee's action. Its future status has not as yet been determined, an unfortunate condition in view of the seriousness of the situation. A concert of effort by AGA with both FPC and, more particularly, the National Assn. of Railroad and Utilities Commissioners is greatly needed if the report is not destined simply to gather dust on a remote bookshelf.

PIPELINE rate increases that become effective under bond probably constitute the most serious financial problem currently being faced by gas utilities. There is clearly no single solution to the problem; in some states the necessary relief may come merely through the speeding up of the regulatory process. It may be aided through the more widespread acceptance of automatic adjustment clauses and simplified refunding procedure, and in some states a modification of state laws may be necessary.

The problem stems from application of Section 4(e) of the Natural Gas Act, which provides that a pipeline company applying for a rate increase that has been suspended by the Federal Power Commission pending investigation and hearings may place the increase into effect under bond five months from the date the suspension was ordered into effect, if no decision has been rendered by then.

While any rate increases pose serious difficulties for distributing companies, rate increases effected under bond have their special perils:

1. Such an increase implies uncertainty as to the *actual* cost of gas currently being purchased, impeding financing arrangements and making guesswork of profits.

2. The increased rate may continue in effect under bond for long periods.

3. Some state commissions may refuse to recognize an increase until its status has been finally determined by FPC.

4. Should a state commission permit bonded rate increases to be passed on to ultimate consumers, FPC might award a permanent rate increase substantially smaller than that being collected under bond, necessitating refunds to ultimate consumers, a highly costly procedure.

Currently, the operation of Section 4(e) involves more than $100 million dollars. In 1952, the commission acted upon a total of $148,953,000 of wholesale natural gas rate increases filed by 30 companies, representing an increase of 65% over the amount filed in 1951. More than 99% of the total amount filed was suspended; as of Dec. 31, only $8,586,000 of the total filed in the year had become effective under bond, but altogether a total of $71.5 million was being collected under bond, including rate increases filed prior to 1952. Furthermore, at the end of the year more than $100 million in increases filed during 1952 was still under suspension, much of which has been going into effect as the waiting periods have expired.

To the average distributor, this means that more than 60% of its total operating expense—the cost of gas—is an undeterminable quantity. This often is equivalent to three or four times a company's operating income. Until relief is granted, in many cases the distributor must operate with a deficit. Financing is made more difficult, and the financial problem is compounded by the heavy, unrelieved out-flow of cash to meet the increased cost of purchased gas.

The tremendous backlog of rate cases piled up in FPC is not the sole factor responsible for protracted increases remaining in effect under bond for protracted periods. In a case involving Atlantic Seaboard Corp., for example, an increase which became effective under bond Sept. 1, 1951, was disallowed the following April because FPC found it to be too high. Nevertheless, Seaboard appealed the decision, so the rates were still in effect at the time of this report—more than 18 months after they were set.

Many state commissions do not recognize bonded increases. There may be legal or other limitations; even where there are no such limitations and the commission is quite willing to recognize such increases, there sometimes appears to be a tendency to "wait and see" if FPC will not be able to reach a final decision in the near future, thus enabling the state commission to render only a single decision and circumvent possible modification at some future date.

Even where distributors are permitted to raise rates before FPC has rendered a final verdict, if the federal commission allows less than the amount asked, the distributor may not only be obliged to modify his own increase, but to make refunds to customers—a costly process involving in some cases millions of small bills, in contrast to the few large bills which the supplier would have to adjust in similar circumstances.

Furthermore, if the distributing utility is assessed a tax based on gross receipts the problem is further complicated in two ways. First, in order to keep the distributing company whole,

its increased rates must reflect not only the increased cost of gas, but also the increased gross receipts tax. Second, in case of a subsequent refund, the utility should be reimbursed for taxes of this nature which were collected on the basis of revenues later refunded to its customers. Preferably and logically this reimbursement should be in the form of a refund from the taxing authority.

Several avenues of relief for distributors are now open. There's the "normal" procedure, whereby the distributing utility may file offsetting increases at the time a wholesaler's increase becomes effective under bond (but not before). Ordinarily the state commission will immediately suspend the distributing company's boost and institute hearings, but these may last from six to 12 months. In some states, as already indicated, even this avenue is not open.

Some states have statutes similar to the Natural Gas Act's Section 4(e) which permit the distributor to effect increases under bond pending disposition of the case; in certain states this may be done immediately, in others the rate requested must be suspended for five months before becoming effective. In some states, the commission has authority to permit temporary rates to become effective pending investigation.

Commissions empowered

Finally (in a very few cases), some commissions are empowered to permit the distributing utility to recoup any loss of revenue occasioned by lower rates being effective pending investigation than those ultimately found appropriate.

A device that may prove helpful is the "keep whole" theory*. This is illustrated by the case of a utility which when compelled to increase its wages by X dollars annually files for an increase just sufficient to offset the higher cost, injecting no other issue into the case. Many such cases have been acted upon by the Wisconsin commission.

A slightly different twist is the action taken by one utility which had its rates increased 70% by a bonded boost from its supplier. In order to avoid the costly procedure of making refunds to its own customers, and in hopes the proceedings before the FPC would soon be settled, the company requested and received an increase equivalent to 59% of the increase in cost of the purchased gas, with the proviso that refunds to its own customers would not have to be made should FPC ultimately grant less than 59% of the supplier's bonded increase. However, more than a year has elapsed since the pipeline company's rates were effected under bond, and having to absorb the 41% is proving burdensome.

Fuel adjustment clauses such as have been used in electric rate schedules since shortly after World War I and were subsequently adopted for manufactured gas and steam service rates would be equally applicable for natural gas rates, both for those put into effect under bond and those finally established.

Some utilities that distribute mixed gas have in their rate schedules fuel and raw material adjustment clauses that protect them against increases in the cost of purchased natural gas. In a few instances, utilities distributing straight natural gas have purchased-gas-cost adjustment clauses.

In one state, upon the recent introduction of natural gas, the commission invited an association of utilities operating within the state to submit its recommendation as to a uniform type of purchased-gas-cost adjustment clause to be included in the rates of all companies distributing natural gas within the state.

Although essentially a means of avoiding pipeline rate increases under bond, rather than an avenue of relief from such increases, a procedure that appears, under appropriate circumstances, to offer advantages to both the pipeline company and the distributing utility is typified in FPC's order of Dec. 17, 1951 in the Tennessee Gas Transmission case.

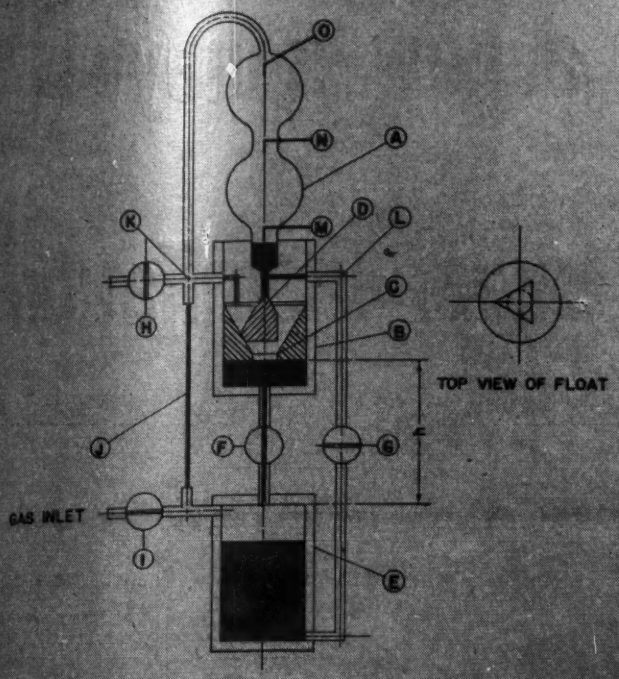
In this proceeding Tennessee Gas had filed increased rates in the amount of $13.6 million per annum to become effective July 16, 1951 (Docket No. G-1741) and an additional increase in the amount of $4.4 million per annum to become effective Aug. 24, 1951 (Docket No. G-1764). The Federal Power Commission suspended both applications and ordered both proceedings consolidated for hearings on Nov. 27, 1951. On Dec. 4, 5, and 6, 1951 all interested parties, including representatives of the commission staff, Tennessee Gas, and all interveners, reviewed figures compiled by the commission staff and reached full agreement on a compromise settlement whereby Tennessee Gas was permitted to increase its rates to the extent of $11,414,696 per annum to become effective Dec. 17, 1951 without refunding liability.

Such a procedure completely avoids all problems associated with pipeline rate increases effective under bond. Uncertainty is avoided. The pipeline company knows what its rates are for the immediate future and its financial statements do not need to reflect the possibility that it might be required to refund a substantial portion of its current revenues. The distributing companies are in a position to go before their state commissions with a positive statement as to the current cost of gas as a basis for requesting increases in their own rates. Although there have been other cases before FPC where similar settlements have been reached, this procedure does not appear feasible in all cases, since it requires the concurrence of all interested parties. The commission must be able to recognize as noncontroversial a sufficient increase in the rate to be acceptable to the pipeline company and the settlement must be agreeable to all interveners and other interested parties which, in some instances, may include representatives of interested state commissions.

Cost to distributors

The cost to distributors of making refunds can vary from almost nothing to a very substantial amount, depending upon the refunding procedure required by the state commission. If the commission, in effect, required that each monthly bill of each individual customer be recomputed, as has been done in some cases, the cost of refunding might easily fall within the range of 15 to 20 cents per bill. For a company serving 250,000 customers, refunding for a 12-month interim-rate period would therefore cost the utility something in the neighborhood of $500,000. If, as an alternative procedure, the commission simply required the company to spread a specific amount of money over the affected bills rendered during a future period equal in length to the interim-rate period, either on a percentage basis or per unit of consumption or other similar basis that might appear appropriate in the specific case, the cost of making the adjustment might be reduced to almost nothing. Also, in cases where the distributing utility was obliged to absorb the pipeline increase for an appreciable period of time before relief was granted, it would seem appropriate to give consideration to the amount of such absorbed cost in determining the amount of refund that should be made. In some cases the refunding operation is further complicated by the existence of state or municipal taxes based on gross receipts.

*Described by William E. Torkelson, chief counsel of the Wisconsin Public Service Commission, in a paper titled "Can the Regulatory Process Be Accelerated?" presented at the 1952 meeting of the National Assn. of Railroad & Utilities Commissioners.



Schematic diagram of the new flowmeter which the National Bureau of Standards has developed for measuring the rate of flow of very small volumes of gas through capillary tubes. The capillary tube (J) is connected into the meter to form a closed system in which the gas under study flows out of a reservoir (E) and through the capillary tube to displace mercury in the calibrated volume chamber (A). The float valve (D) regulates the flow of mercury out of the volume chamber as it is displaced by the incoming gas and also maintains constant the height (h) of the mercury column which supplies the hydrostatic pressure causing the gas to flow through the capillary tube. As the displaced mercury passes out of the calibrated volume chamber, it breaks contact successively with the electrodes O, N, and M, thus activating a timing circuit. The pressure in the float-valve chamber is made equal to that in the calibrated volume chamber by the connecting tube K. The valve H connects the apparatus to a vacuum system for preliminary purging of gas. The gas sample to be studied is admitted to the flowmeter through the valve I. The tube L and valves F and G are used in filling the reservoir (e) with gas and the volume chamber with mercury before measurements are begun.

New NBS flowmeter gives gas-viscosity data at high temperatures and pressures

IN THE course of the National Bureau of Standards' work on a broad program of research on the viscosity of gases at elevated temperatures and pressures, a unique type of flowmeter[1] has been developed. Designed by J. C. Westmoreland of the NBS staff, the instrument controls and measures the flow of very small volumes of gas, such as those required in a small capillary tube viscosimeter.

The device has enabled the bureau to obtain data hitherto unavailable on the viscosity of pure gases and their mixtures.

The program was initiated under the sponsorship of the National Advisory Committee for Aeronautics as a study of hydrocarbon mixtures and combustion products composed of various proportions of nitrogen, carbon dioxide, argon, oxygen, carbon monoxide, and water vapor.

Accurate data on the viscosity of gases are required in designing transmission and measurement systems for fuel gases and in constructing gas-flow systems in chemical plants. Because the viscosity of a gas is an important factor in the rate of heat transmission between gases and metals, gas-viscosity data are also needed in the design of gas turbines and jet engines. With the continued development of new engines of this kind, the need for information on the viscosity of the exhaust gases at high temperatures is becoming increasingly important.

At present, available data on the viscosity of gases are very meager, particularly at temperatures above 1000° F. To meet this need, the National Bureau of Standards has undertaken to determine the viscosity of pure gases and gas mixtures at pressures from 5 to 10,000 lb per sq in. and over the temperature range from 60° to 2500° F.

In the NBS program, viscosities are measured by timing the flow of the gas under study through a very fine capillary tube. If the dimensions of the tube are known, the viscosity can be computed by means of Poiseuille's law[2] from the volume rate of flow through the tube and the pressure drop from inlet to outlet of the tube. The capillary tubes are of Inconel, with average internal bores of 0.038 cm and lengths up to 434 cm. For high-pressure operation the tubes are enclosed so that they have only to withstand the small pressure differential caused by the flow of gas. The capillary enclosure is heated electrically, and temperatures are measured with chromel-alumel thermocouples. At high temperatures a coiled capillary is used.

In order to obtain as accurate viscosity values as possible, it was decided to measure the rate of flow of the gas through the capillaries by means of some metering device employing a volumetric displacement. This method would have the advantage that the volume could be evaluated directly by conventional methods and would not involve the measurement of an auxiliary quantity. As no flowmeter capable of measuring the extremely small flow rates through the tubes was available, it was necessary to design such an instrument. The apparatus that was

[1] For further technical details, see "A Meter for Timing the Flow of Very Small Volumes of a Gas," by J. C. Westmoreland, NACA Research Memorandum RM52109.

[2] According to Poiseuille's law, when a fluid flows through a capillary tube, the volume rate of flow is given by $\frac{\pi r^4 \blacktriangle p}{8 \eta l}$, where r is the radius and l the length of the capillary, $\blacktriangle p$ is the pressure drop across the tube, and η is the coefficient of viscosity of the fluid.

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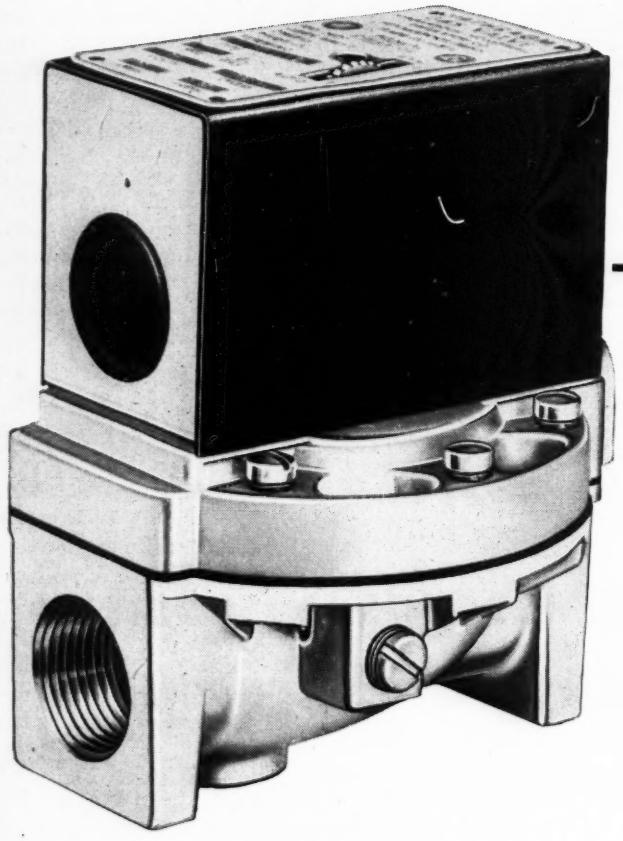

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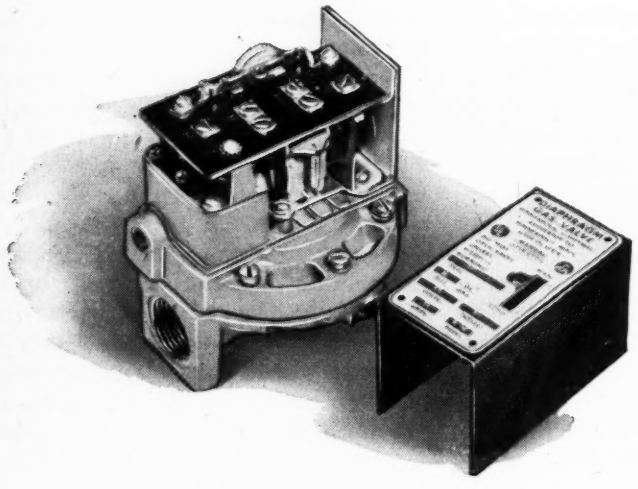

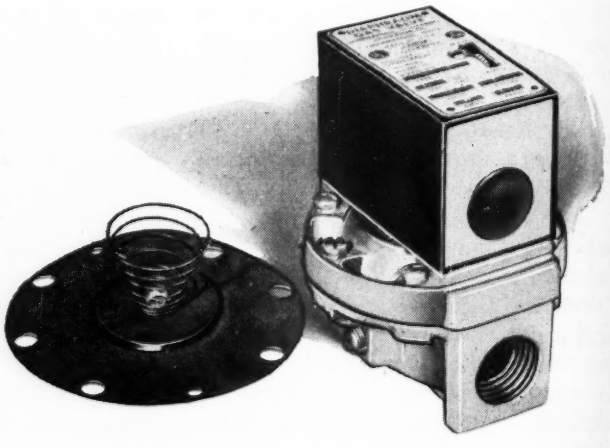

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The V88 has a new improved terminal panel (above) which includes the safety pilot terminals, thus making it easier to interconnect the pilot circuit. Top terminals facilitate wiring and eliminate need for right and left hand models.

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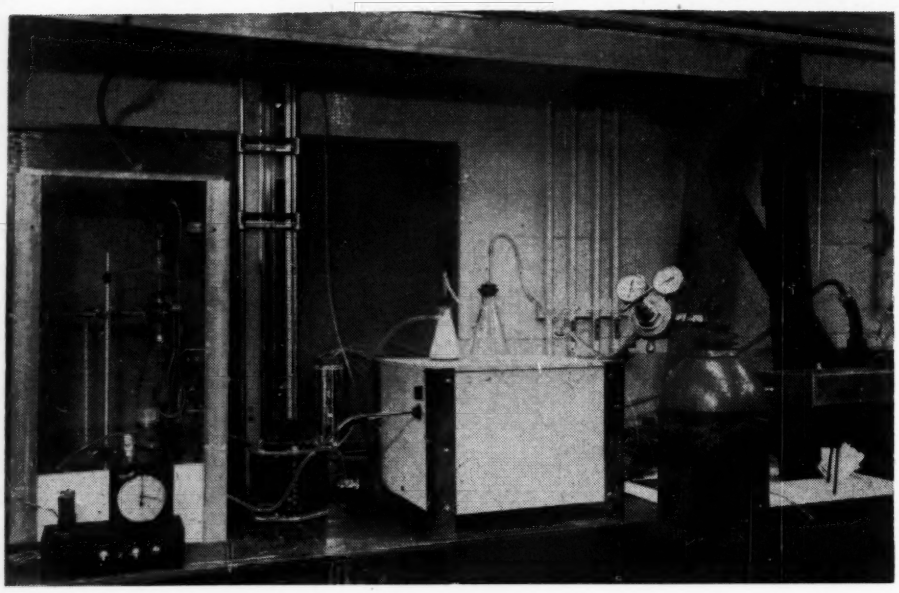
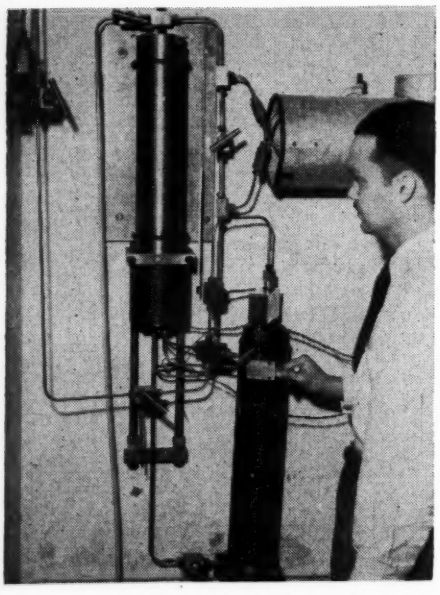


Apparatus used in studies. Viscosity is determined by measuring the rate of flow of the gas under study through a very fine coiled capillary tube within the high-temperature furnace (center). All of the gas which flows through the capillary tube also passes through the new NBS flowmeter (enclosed in the transparent temperature-controlled enclosure at left); here the time for a given volume to flow through the capillary is measured and indicated on the clock in the front of the meter. The gas sample, obtained from the gas cylinder at right, flows first through flasks (above furnace) containing a drying agent before entering the capillary in the high-temperature furnace. The manometers (right of flowmeter) measure the vacuum within the flowmeter.



A pressurized model of the new NBS flowmeter (within the two cylinders at left) is used to measure the rate of flow of the gas under study through a very fine calibrated capillary tube enclosed in the insulated and heated enclosure at upper right. The pressurized container at upper left contains all of the flowmeter except the gas-mercury reservoir, which is in the pressurized container below it.

developed not only determines these flow rates accurately at pressures up to 500 atmospheres but also includes a means of regulating the rate of flow and of measuring or pre-establishing the pressure drop over the capillary.

In previous investigations, determination of the viscosity of a gas at high pressures has required a knowledge of the compressibility effects of the particular gas being tested. However, in the NBS experiments the new flowmeter is used to measure the volume rate of gas flow at the static pressure of the test, and an absolute knowledge of the compressibility of the gas may not be required. Under the conditions of operation of this device, the Poiseuille expression is completely defined at the test pressure and temperature, and the relationship is essentially independent of the thermodynamic deviations from an ideal gas.[3]

The flowmeter developed at the bureau (see drawing) consists essentially of a calibrated volume chamber, a float-valve chamber, and a gas-mercury reservoir. These are connected in with the calibrated capillary tube to form a closed system in which the gas under study flows out of the reservoir and through the capillary tube to displace mercury in the volume chamber. The float valve regulates the flow of mercury out of the volume chamber as it is displaced by the incoming gas, and at the same time maintains constant the height of a mercury column which provides a hydrostatic pressure causing the gas to flow through the capillary tube. As the mercury passes out of the volume chamber, it breaks electrical contact with successive platinum electrodes, thus activating relays which start and stop a clock. In this way the time required for the measured volume of gas to flow through the capillary tube is obtained.

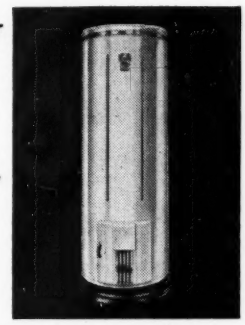
No energy from the gas stream is employed in replacing the mercury, which is made to flow by gravity out of the calibrated container through the float valve chamber at a rate equal to the rate of gas inflow. The replaced mercury is then added to the top of the mercury in the hydrostatic column, replacing mercury which passes out of the small-diameter tube forming the power part of the column and into the gas-mercury reservoir. The mercury which thus enters the reservoir in turn replaces the gas which is continually leaving the reservoir to pass through the calibrated capillary tube. A pressure-equalization tube, which joints the calibrated gas collection chamber to the float-valve chamber, insures that the pressure differential across the capillary tube shall be only that due to the column of mercury above the gas-mercury reservoir.

The volume chamber is made of glass and is divided into two equal parts, one above the other, with a necked section in between the two and at the base of the lower chamber. The principal purpose of the upper volume is to provide a starting period during which flow conditions may become stabilized. The necked sections make the cross-sectional area small in the plane of the contact break.

The float chamber, float, and valve are all made of methyl methacrylate. It was found that a valve and valve seat of this plastic material are not eroded by the flowing mercury as a steel valve would be. Moreover, the mercury remains clean in contact with the methyl methacrylate.

In the operation of the flowmeter, the entire apparatus, with all of the mercury in the reservoir, is first connected to a high-vacuum pump and purged of all gas as completely as possible. A valve in the column between the float-valve chamber and the gas-mercury reservoir is then closed, and a gas-sample inlet valve is opened, admitting gas from an external container to the reservoir. This causes the mercury in the reservoir to rise through an auxiliary connecting tube

[3] The compressibility of a gas is not independent of temperature; and if the flowmeter cannot be operated at the same temperature and pressure as the capillary tube, it will, of course, be necessary to make the appropriate correction to the volume.



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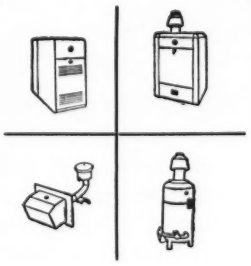

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Cincinnati Gas takes honors in PUAA Better Copy Contest

In winning four first-place awards in the annual Better Copy Contest, Cincinnati (Ohio) Gas & Electric Co. won top honors in the No. 1 classification, involving all utility companies and their complete advertising programs. As a Class A company (400,000 or more customers), Cincinnati Gas also placed first for its literature distribution to customers, for its window display, and for its interior display.

Other winners in more than one classification were Portland (Ore.) Gas & Coke Co., three; and East Ohio Gas Co., Arizona Public Service Co., Central Hudson Gas & Electric Co., and Washington Water Power Co., all with two firsts.

The Public Utilities Advertising Assn.-sponsored contest attracted more than 2000 entries in 17 regular classifications and five special classifications. Below are the official first-place winners of the contest:

1. For all utilities—complete programs: Group A, Cincinnati Gas & Electric; Group B (between 150,000 and 400,000 customers), Wisconsin Electric Power; Group C (less than 150,000 customers), Tampa Electric Co.

2. For all utilities—series of three to five newspaper ads on a public relations subject: Group A, Philadelphia Electric Co.; Group B, Arizona Public Service; Group C, Mississippi Valley Gas Co.

3. For all utilities—single newspaper ad on any subject: Group A, Northern States Power Co.; Group B, Wisconsin Power & Light Co.; Group C, Pacific Power & Light Co.

4. For all utilities—employee magazines: Group A, Detroit Edison Co.; Group B, United Illuminating Co.; Group C, Hartford Electric Light Co.

5. For all utilities—employee newspapers: Group A, Consumers Power Co.; Group B, Arizona Public Service; Group C, Central Hudson Gas & Electric Co.

6. For all utilities—series of direct mail pieces: Group A, Consolidated Gas, Electric Light & Power Co. of Baltimore; Group B, British Columbia Electric Co.; Group C, Portland Gas & Coke Co.

7. For all utilities—any booklet, pamphlet, or other piece distributed to customers: Group A, Cincinnati Gas & Electric; Group B, Dayton Power & Light, Group C, Washington Water Power Co.

8. For all utilities—printed material used in dealer promotion: Group A, East Ohio Gas Co.; Group B, New Orleans Public Service; Group C, Central Hudson Gas & Electric.

9. For all utilities—special employee literature other than house organs: Group A, Consolidated Edison of New York; Group B, Utah Power & Light; Group C, Saskatchewan Power Co.

10. For all utilities—window display: Group A, Cincinnati Gas & Electric; Group B, Southwestern Public Service Co.; Group C, Pennsylvania Power Co.

11. For all utilities—interior display: Group A, Cincinnati Gas & Electric; Group B, Central Maine Power Co.; Group C, Washington Water Power.

12. For all utilities—car and bus cards and truck posters: Group A, Union Electric Co. of Missouri; Group B, Toledo Edison Co.; Group C, Portland Gas & Coke.

13. For all utilities—outdoor advertising: Group A, Public Service of Northern Ill.; Group B, Laclede Gas Co.; Group C, Chattanooga Gas Light Co.

14. For all utilities—annual report to stockholders: Group A, Niagara Mohawk Power Corp.; Group B, Connecticut Light & Power Co.; Group C, Minnesota Power & Light Co.

15. For all utilities—radio advertising (one group): East Ohio Gas.

16. For all utilities—motion pictures (one group): Columbia Gas System Inc.

17. For all utilities—television (one group): Ohio Fuel Gas Co.

Special Classification C (gas companies only)—single newspaper ad promoting use of gas: Group A, Southern California and Southern Counties Gas Co.'s; Group B, Peoples Natural Gas Co.; Group C, Arkansas Louisiana Gas Co.

Special Classification D (gas companies only)—single newspaper ad selling gas merchandise: Group A, Brooklyn Union Gas Co.; Group B, Equitable Gas Co.; Group C, Portland Gas & Coke Co.

At the PUAA annual meeting where the Better Copy winners were announced, the following officers were elected:

Walter G. Heren, Union Electric Co., St. Louis, president; C. Fred Westin, Public Service Electric & Gas Co., Newark, 1st vice president; Ray W. Fenton, Peoples Gas, Light & Coke Co., Chicago, 2nd vice president; Robert H. Bridges, Cleveland Electric Illuminating Co., 3rd vice president. Secretary George G. Hanel, Connecticut Light & Power Co., Hartford, and Treasurer Mead Schenck, Interstate Power Co., Dubuque, Iowa, were re-elected.

Flowmeters (continued)

into the passage above the float valve. As the tube below the float valve is now blocked off, the mercury will first fill the float chamber enough to close the float valve and will then fill the calibrated volume chamber. A cock in the auxiliary connecting tube is then closed. When the inflow of the sample gas has brought the pressure within the reservoir to the desired value, the gas-sample inlet valve is also closed.

Before measurements are taken, sufficient time must elapse for pressure conditions to equalize throughout the system. Then the meter is placed in operation by opening the valve in the column connecting the float-valve chamber with the gas-mercury reservoir. The outflow of mercury from the float-valve chamber lowers the float, opening the float valve so as to admit mercury from the calibrated volume container into the float-valve chamber. Whenever this inflow from the volume chamber exceeds the outflow into the reservoir, the float valve automatically closes. Thus the pressure which the mercury column exerts on the gas entering the capillary tube is kept constant, and the rate at which mercury flows out of the volume chamber is controlled by the rate of flow of gas through the capillary.

In making the determinations, the apparatus is first pressurized at a specific temperature. Flow measurements are then carried out at decreasing pressure levels, and the viscosities are computed for each value of pressure. This procedure gives a family of isotherms showing the variation in the viscosity of the gas sample with pressure at the temperature of the test.

In addition to its use in viscosity studies, the new flowmeter may find application in determining the specific gravity of a gas by the effusion method. For this purpose the capillary tube would be replaced by a thin metal diaphargm containing a small orifice.

Because the viscosity of a gas changes rapidly with temperature, the bureau's flowmeter should also prove useful for measuring temperatures, particularly at elevated levels where thermoelectric means have proved unreliable. For such use, the capillary tube would be coiled into a compact sensing unit which would be charged once and for all with a suitable gas. The time interval for a given volume of the gas to flow through the capillary would then be a measure of the average temperature of the capillary.

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Excerpts from two AGA distribution meet reports

Vary techniques in X-raying welds

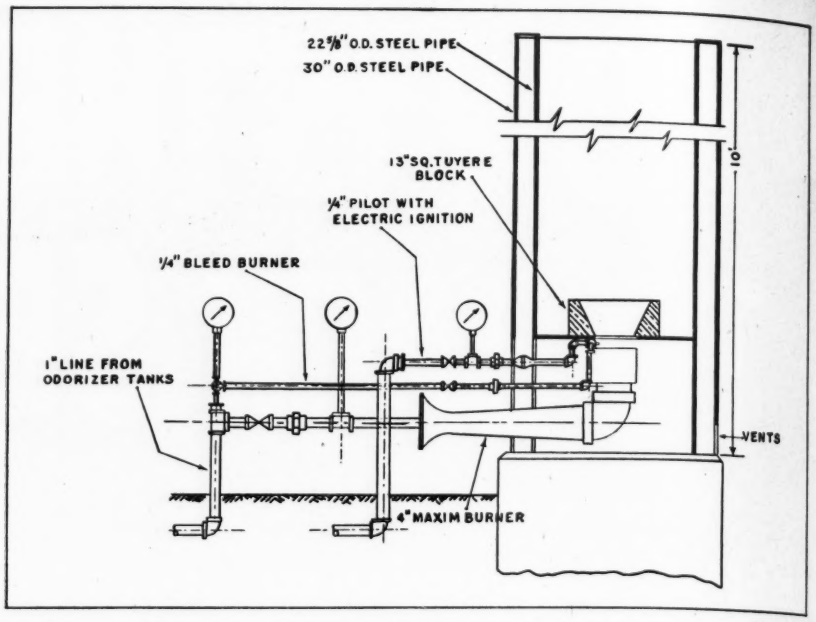
By HAROLD HOVLAND
Industrial X-Ray Engineers, Seattle

The greatest benefit to be obtained from X-ray inspection of pipelines is the control of weld quality. The most effective control is obtained by having the radiographs available for prompt inspection. Therefore, the chief aim of the X-ray crew must be directed to speed without sacrifice in quality. For this reason, procedures and techniques used for pipeline inspection must be tailored to fit the particular conditions. For instance, one cannot use the same procedure for inspecting 8-in. diameter pipe as 30-in. diameter. The smaller pipe would call for outside elliptical shots on one film, which can reproduce with accuracy and good quality 75% of the circumferential weld.

As the diameter of the pipe increases the elliptical shot procedure must be replaced by the internal examination method to give the maximum sensitivity in defect detection. Under this method the X-ray apparatus is propelled through the pipe by a tractor-type machine. An automatic locating device stops the machine at each weld and the source of radiation—the X-ray tube—is positioned in the center of the pipe. A continuous film is wrapped around the circumference of the weld to make the radiograph. With this method the machine can take as much as 4000 ft of pipe without being removed from the pipe.

Station work, bellhole work, and other types of applications also require specialized equipment and procedures to obtain highest sensitivity in defect detection. On water crossings laid from a barge, the entire crew has to await the X-ray report because only one joint can be welded at a time. It is therefore highly important that the radiograph be produced and developed in the shortest possible time. In this situation the best procedure is to leave the X-ray machine inside the pipe and position it by a line threaded through the line-up clamp. In this way the wrapping crew can proceed with its work, while the radiograph is being developed, and if the weld is acceptable the only lost time for the construction crew is the time required to make the exposure—perhaps not more than two minutes.

Examination of tie-ins presents another situation where speed in producing the radiograph means dollars to the contractor and therefore to the owner. It is highly important for the radiograph to be taken and developed before the tie-in crew leaves the spot.



Section of waste gas burner constructed from surplus pipe and standard burner equipment.

Waste gas burner disposes of gas vented from odorizer tanks

By N. A. MANFRED
Chicago District Pipe Line Co., Joliet

Odorizer tanks and lines must frequently be depressured to permit refilling of supply and storage tanks and maintenance work. The depressuring process requires the venting of odor-saturated gases and odorant vapors to the atmosphere. This vented gas, when released untreated to the atmosphere, can cause the odorizer to become a nuisance within the station area. An ideal location is one free from habitation within a radius of one mile or more, although under proper wind conditions, odor complaints have been received several miles from the odorizer. Not many odorizers are ideally located, and what might originally have been an ideal location may now be adjacent to new housing developments. The solution is to either deodorize the vented gases or burn them.

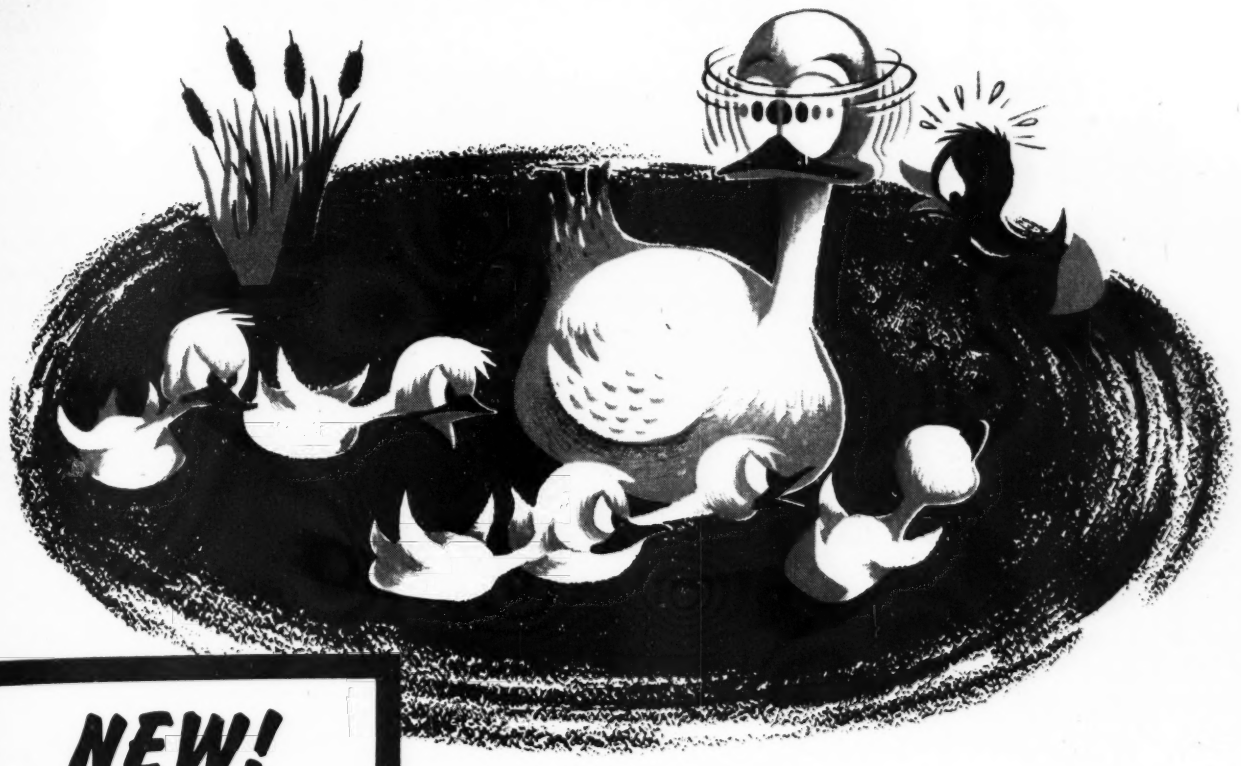
Deodorization of the vented gases may be accomplished by passage through absorbents such as activated charcoal, silica gel or bubbling through caustic solutions. These methods are suitable for small odorizers where the quantity of materials used is small and the problem of their disposal after use is minor. For larger odorizers the disposal of the spent absorbents could create as great a nuisance as venting odorized gases to atmosphere.

The disposal of large volumes of vented gases can best be accomplished by flaring—a method employed at coke ovens and in the oil industry for destroying waste gases.

A flare burner for use with odorizers can be constructed of readily obtainable materials. We recently constructed a flare burner from surplus pipe and standard burner equipment. The pipe consisted of two pieces 10 ft long, one 22 in. in diameter and the other 30 in. in diameter. These pieces were set vertically on a concrete pad with the smaller pipe inside the larger one. The large pipe acts as a heat shield with the aid of air circulating between the two shells. Suitable openings at the bottom of each pipe allow for the mounting of two gas burners and a gas pilot. Combustion takes place in the 22-in. pipe. One burner is capable of consuming 600 cu ft of 1000 Btu gas per hour and the other 25 cu ft per hour. All vent lines from the odorizer and underground storage tank terminate at the flare burner which is located approximately 40 ft away.

The flare burner is used in connection with depressuring the 250-gal. supply tank. By regulating the vented gas pressure to 30 psi at the large burner, this tank can be depressured within 15 minutes from an initial pressure of 250 psi. The small burner is used to burn the smaller volumes of vented gases when the supply and storage tanks are being filled. Ignition is maintained by constant pilot light operation.

The burner just described is designed for large volume operations. For smaller installations the size of flare burner can be scaled down; however, the principle of design is identical. Approximately eight of these burners are in use within the Chicago area and others are contemplated.



NEW!

Oronite ALERT 80

The improved Alert Gas Odorant

As the requirements for a gas odorant change, so must a gas odorant change to meet today's long-line, high-pressure transmission systems. Alert 80 is a selected and blended group of mercaptans with new blending and balancing to give better, full-range volatility and stronger initial "punch".

Alert 80 will vaporize more evenly in a by-pass absorption type odorizer assuring adequate odorization at any pressure or temperature; it vaporizes faster in the line when using a liquid injection type odorizer; it has "carry-through" to warn instantly when a leak occurs.

Alert 80 is already proved by utilities in actual use for over a year. It has met every test.

Get the full story. Write or phone the Oronite office nearest you.

Other ORONITE Odorants

2. L-P Gas Odorant
3. Calodorant
4. Calodorant "C"
5. Calodorant "C" Special

it's 5 to 1

ORONITE HAS A GAS ODORANT DESIGNED FOR YOUR OPERATING CONDITIONS

It's a fact that no single gas odorant will do the best, most efficient job under all operating conditions. Because of this, Oronite offers a choice of five gas odorants—three of the cyclic sulfide type and two mercaptans.

In this group you will find the right odorant for your operating conditions, your equipment, your cost specifications.

Our wide experience as a pioneer and leader in the field is at your disposal. Just contact any Oronite office and talk your problem over with a gas odorant specialist.

ORONITE CHEMICAL COMPANY

THE NAME CHEMICALS

New Odorometer!

"A complete room test in a package"

Developed by Oronite, it does your room testing work for you. Contact any Oronite office for a demonstration or write for bulletin and complete information.

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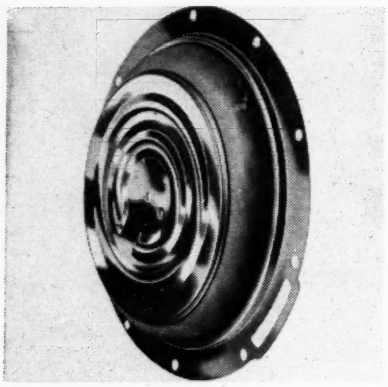
2617

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon and mail, indicating by number the information or literature needed.



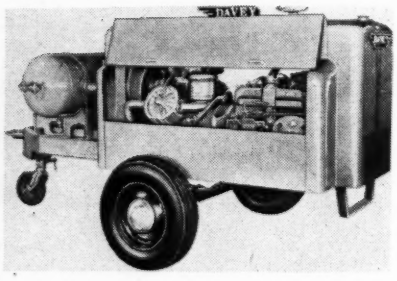
1 Metal Rim Diaphragm

A grooved metal rim and an endless metal tie ring to secure the leather to the rim are incorporated in a new groove type metal rim diaphragm for small gas meters announced by Lancaster Meter Parts Co.

Smoother meter performance and greater measuring accuracy are advantages offered. The grooved metal rim increases the strength and rigidity of the diaphragm and assures a perfect circle. The leather is held more firmly in place and a smaller amount of leather is required, permitting an equal amount of leather at both the "in" and "out" stroke extremes. The endless metal tie band provides a strong wrapping method which secures the leather diaphragm to the rim with uniform pressure.

Lancaster Meter Parts Co.

■



2 Compressor

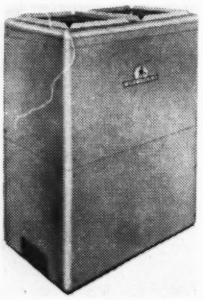
The Super Chief Model 210-WDS is a new 210-cfm compressor of high-speed, 2-wheel trailer design from Davey Compressor. The unit is 145 in. long, 62 in. high, and 72 in. wide and weighs 3400 lbs.

Of "W" series design, the compressor unit is equipped with Davey multi-port valves that are said to increase by 15 to 25% the amount of air delivered per pound of fuel. Engine is of Hercules 6-cylinder design with a power surplus of over 25%.

Davey Compressor Co.

■

3 Air Conditioner



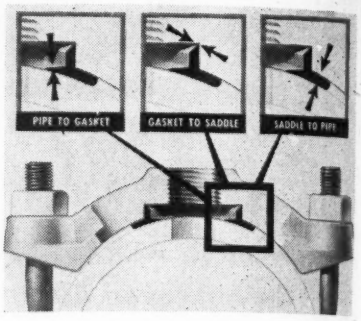
An air conditioner that can be installed in any forced warm air heating system or in any gravity system that can be equipped with a boiler is being manufactured by Iron Fireman Manufacturing Co.

Included in the system is a thermally activated multiple feed expansion valve; a receiver for a generous supply of Freon 12 refrigerant; a condenser that can be connected either to a city water system or to a cooling tower; and a spring-mounted compressor, isolated from refrigerant lines by vibration eliminators to reduce operational noise.

Complete protection is furnished by a thermal overload device and by a high-low pressure control. A thermostat or humidistat is electrically connected with the solenoid valve to assure accurate temperature and humidity control. The unit is available in 2- and 3-ton sizes.

Iron Fireman Manufacturing Co.

■



4 Service Saddle

A new service saddle for water and gas use is the R. H. Baker ShurSeal saddle that features three sealing elements in the saddle's rubber gasket to effect a seal between the saddle and the pipe with only moderate tightening on the U-bolt.

As the hydraulic pressure increases within the saddle, two tips on the gasket are pressed against their sealing surfaces, and complete the seal started by the third seal—between the saddle and the pipe.

The saddle is furnished with single or double straps, either as a ShurSeal cast iron saddle or a ShurSeal bronze saddle. Straps are formed to fit the pipe so that U-bolt pressure is evenly distributed. They are made

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GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

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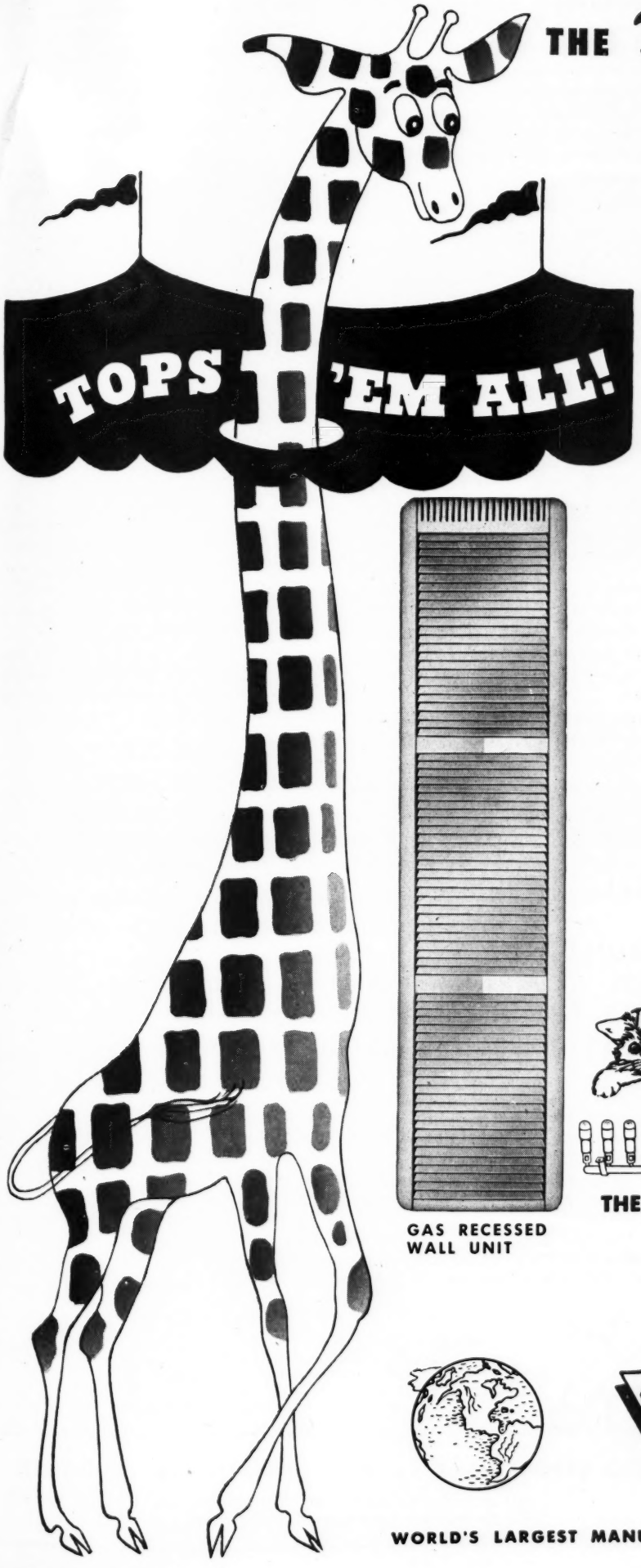


THE *New*

EMPIRE

Gas HEATING APPLIANCES

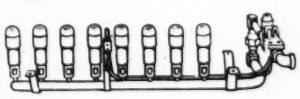
IT'S COOL!
IT'S COOL!

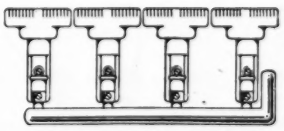
GAS COOL CABINET
RADIANT CIRCULATOR
HEATER

GAS FLOOR
FURNACE

SILENT AS A KITTEN
WITH AN EXTRA SET
OF FOOT PADS

GAS RECESSED
WALL UNIT





THE FAMOUS

"Thriftmatic"
Gas
BURNERS

EMPIRE

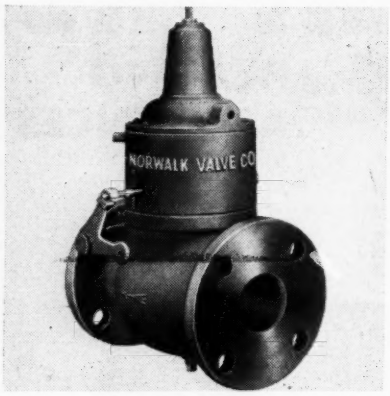
BELLEVILLE, ILLINOIS

WORLD'S LARGEST MANUFACTURERS OF GAS FLOOR FURNACES

for pipe sizes from 1-in. to 24-in., and taps from ½-in. to 4-in.

R. H. Baker & Co. Inc.

■



5 Cutoff Valve

Designed primarily to prevent runaway pressures in low pressure systems, the new Norwalk positive pressure cutoff valve can be used in large industrial or commercial installations to prevent excessive buildup of pressure in case of failure of the service regulator or other unforeseen cause.

Since the controlling pressure is independent of the gas flow, the valve can be used with slight modification as a safety shutoff valve when it is essential that both gases be shut off if the flow of one ceases.

Another feature of the Norwalk valve is the addition of a fusible link to the controling lever arm that causes the valve to operate in case of fire by stopping the flow of gas throughout lines within areas endangered.

The valve is available in sizes from 2 to 16 in. and can be adjusted to cut off at any desired pressure.

Norwalk Valve Co.

■

6 Furnace

A. O. Smith Corp. is now producing a new Lo-Boy gas fired furnace, companion to the Hi-Boy, which has been in production since last year.

Outstanding feature of the new furnace is its "Magic Heet," which constantly takes the temperature of the air in the house and then automatically adjusts the heat to match the degree of warmth required in the house at any given time. It regulates the volume of heat by adjusting the flame higher or lower as needed.

Both the Lo-Boy and the Hi-Boy are capable of modulating input from 100,000 Btu down to as low as 40,000. Bonnet output in each unit ranges from 80,000 to 32,000 Btu and register output from 68,000 to 27,200 Btu.

A. O. Smith Corp.

■

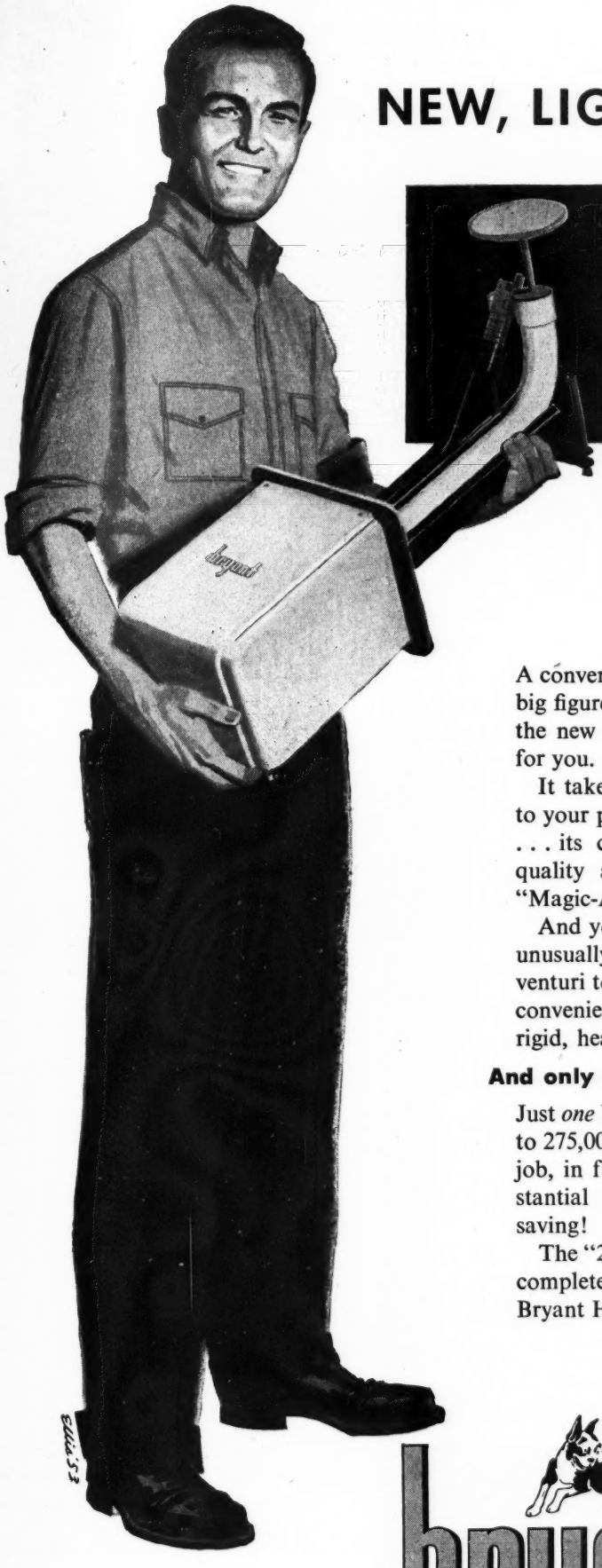
7 Incinerator

The Climatrol incinerator, manufactured by L. J. Mueller Furnace, is being offered in two models: the deluxe, finished in white baked enamel, and the standard grey model. The unit is shipped completely assembled, ready for installation.

The incinerator uses a 1700 Btu input flame, which is shielded so that it cannot be extinguished by wet garbage or other material falling on it.

L. J. Mueller Furnace Co.

. . . it had to happen!
NEW BUILDING,
NEW COMPANY NAME
HONORS THE INDUSTRY'S LEADING
GAS PRESSURE REGULATORS—
Thanks to you, our customers, we've grown out of our britches!! We've just completed a "2-pants" plant to handle your ever-growing needs for MAXITROL Gas Pressure Regulators.
In occupying the new plant we also adopted a new name — MAXITROL COMPANY — honoring the "star" of our show.
Our new and greater production, engineering and research facilities, and our increased personnel will set an even greater goal for MAXITROL achievements.
MAXITROL
COMPANY
formerly
DETROIT REGULATOR CO.
Tomorrow, as yesterday, you may look to MAXITROL for engineering and imaginative leadership!
12200 BEECH ROAD • DETROIT 28, MICHIGAN
Sold on the Pacific Coast by: PACIFIC SCIENTIFIC CO.
San Francisco, Los Angeles, Seattle, Portland



NEW, LIGHTWEIGHT

Conversion Burner

needs only one man to demonstrate and install!

A conversion burner that weighs only 40 pounds can knock big figures off your installation and sales costs. That's why the new Bryant "208" Burner is a big profit opportunity for you.

It takes only *one* of your men to carry the "208" right to your prospects . . . to show them its sturdy construction . . . its compact, eye-appealing design . . . its unusual quality apparent in features like "Finger-Tip" Igniter, "Magic-Action" Valve, "Safety Sentinel" Pilot.

And you need only *one* man to install the "208". In this unusually light design we have provided a telescoping venturi to give a wide range of dimensional adjustment . . . convenient leveling legs at both front and rear . . . and a rigid, heavy-gauge frame assembly.

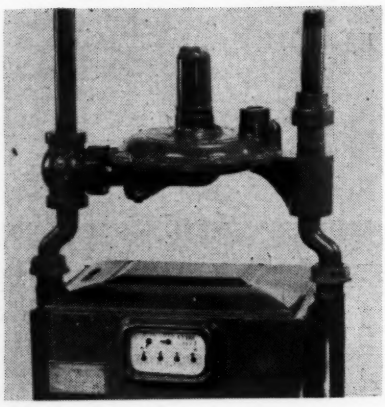
And only ONE basic unit meets all your requirements!

Just *one* basic "208" unit covers the entire range from 75,000 to 275,000 Btu/hr for natural gas. You can install it on any job, in furnaces or boilers, large or small. Result—a substantial reduction in inventory requirements—another saving!

The "208" uses all gases. It is priced surprisingly low. Get complete information from your Bryant Distributor or write: Bryant Heater Division, 17825 St. Clair Ave., Cleveland, O.

bryant®

HEATING
AIR CONDITIONING
WATER HEATING

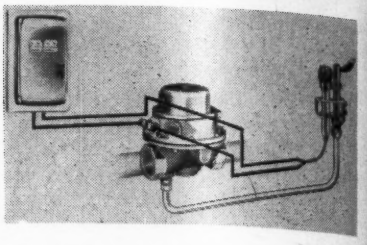


8 Meter Bar Regulator

A new regulator designed specifically for use where a meter bar is required is the "173" meter bar regulator, which is a complete unit combining Rockwell Manufacturing Co.'s standard "173" service regulator with a meter bar.

The new regulator has a vertical inlet in four sizes: ½-, ¾-, 1-, or 1¼-in., and can be provided with an optional horizontal inlet in ½-, ¾-, and 1-in. sizes. The vertical outlet comes in the latter three sizes and a union and elbow assembly can be provided.

Rockwell Manufacturing Co.



9 Control System

As a highlight of the 1953 gas control line, General Controls has developed a new, super-powered BX 69 all-gas control system with pilot generating 700 millivolts plus to insure dependable control system operation when limit controls, time switches, etc., are inserted in the wiring system.

The company has also announced that in addition to a super-powered PG-9 pilot generator, a new mercury tube Model T-99 thermostat will supplement the company's T-70 action contact line of heat anticipation thermostats.

General Controls Co.

ARCCO
ARCCO NEVER-DRY PEN
Writes for Months
REPLACES OTHER MAKES • USES REGULAR INKS
Regardless of pulsations or other causes of ink failures this new Never-Dry Pen will make clean and complete records. Ink supply lasts for several months without refilling reservoir. Capillary tube from ink bottle placed in instrument case feeds pen with continuous flow. Closed system sealed from atmosphere prevents clogging and dirt accumulation.
Weight of pen is constant at all times thus insuring extreme accuracy. No slopping or dripping. Stainless steel construction—no corrosion. When ordering, specify make and type of recording instrument.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
$6.00 each Net
Send for quantity prices
SEND FOR BULLETIN No. 115

Trade Literature

10 Engine Bulletin

Complete data and specifications on Cooper-Bessemer 4-cycle Type LS engines of 15½-in. bore and 22-in. stroke are contained in a new bulletin. Illustrations are included on the gas, gas-diesel, atmospheric or supercharged engines.

Cooper-Bessemer Corp.

■

11 Eclipse Catalogs

Two new catalogs are available from Eclipse Fuel Engineering. (When ordering copies, use letter preceding description together with number of the notice.)

(a) Catalog K-100 describes and illustrates Eclipse centrifugal pressure blowers that offer air supply for all types of combustion equipment.

(b) Catalog P-1 describes more than 12 different styles of rigid meter bars.

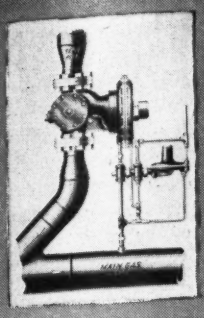
Eclipse Fuel Engineering Co.

■

12 Truck Crane Bulletin

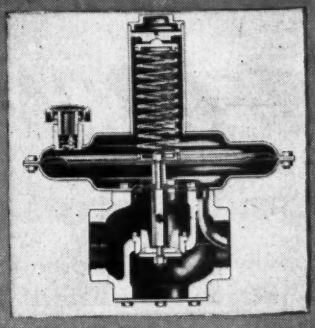
Schield Bantam has published a new bulletin describing its 6-ton, ⅜-yd model T-35 truck crane. Detailed mechanical specifications, complete dimensions and operating data, information on various truck mountings, and typical interchangeable attachments used with the Bantam crane boom are included. Weights, applications, and approximate production outputs of eight different attachments are outlined, together with charts of lifting capacities and discussions of the wide choice of mountings available.

Schield Bantam Co.



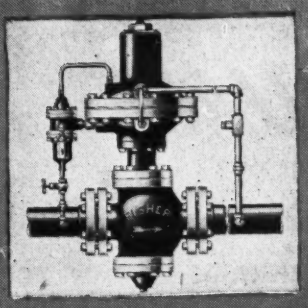
TYPE 29

Full capacity relief valve for distribution systems where large volumes may be discharged without a substantial increase in system pressures. For complete protection against excessive pressures.



TYPE 66

Low-pressure sensitive industrial regulator for inlet pressure up to 5 lbs. Reduced pressure "WC to 1 lb. Sizes 2", 3", and 4".



TYPE 880

High-pressure gas regulator with no bleed to atmosphere, for border stations, loop lines, and big industrials. Extreme stability combined with excellent performance.

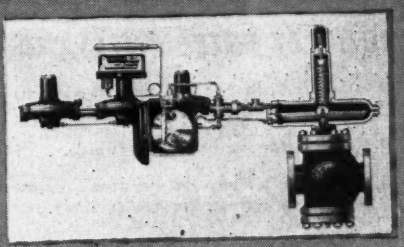
AS MEN PREFER

Best Gas Regulators

The Industry's Most Complete Line

Fisher Governor Company's wide variety of regulators handle control applications ranging from the natural gas well head to burner utilization. Illustrated are just a few of the varieties of construction.

This complete Fisher line of regulators for the gas industry includes District Regulators, high, low and intermediate pressure — Distribution Regulators — House Service Regulators—High Pressure Field Regulators—Boiler Gas Fuel Governors — Booster Regulators — Safety Shut-Off Regulators—Town Border Station Regulators—Industrial Gas Regulators—Meter Run Regulators.



TYPE 298A-831LTC

As a district regulator the Fisher Time Temperature Booster will automatically increase the low pressure when the temperature drops to compensate for the increased load of residential heating. It automatically lowers the pressure during high-temperature periods.

COMPANY • Marshalltown, Iowa

FISHER

Since 1880

BETTER GAS PRESSURE CONTROL

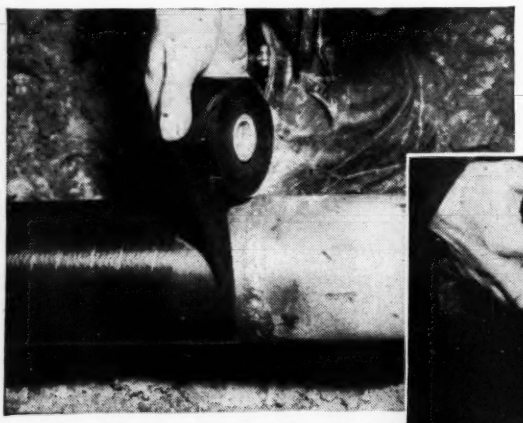
DRESSERTAPE* ... the name that means

QUALITY PROTECTION

... against corrosion

Gas men for over 50 years have known that any product bearing the Dresser name really does the job for which it is made. Before recommending Dressertape to you, *we* made sure it would work—give you the lasting protection you need. Now, we ask you to try it, with the same confidence you have in other Dresser products.

Dressertape can save plenty of expensive man-hours and cut your over-all costs on every job where pipe protection is required—because it's faster, simpler, more effective.



Welded joint is quickly and permanently protected by Dressertape without special surface preparation.

Complete, uniform coverage of irregular joints and fittings is easy with Dressertape. No gaps, voids or holidays.

LOOK AT THESE OUTSTANDING DRESSERTAPE FEATURES!

- Easy, clean to apply—sticks at a touch, no heating equipment required.
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* Dressertape is a trade-mark of Dresser Manufacturing Division

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(One of the Dresser Industries)
Warehouses: Houston, Texas and South San Francisco, California

Gentlemen: ☐ Please send detailed information and literature about Dressertape.

☐ Please have your sales engineer call with Dressertape samples.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE NO _____ STATE_____

13 Armco Booklet

The extra low carbon grades of steel—18-8 ELC and 18-12 Mo ELC—are explained in a booklet published by Armco Steel Corp. The illustrated booklet contains tables on chemical analysis and typical mechanical properties in addition to covering such subjects as why carbon causes corrosion, how special steels conserve scarce alloys, how to weld ELC stainless steels, and applications of Armco steel types 304L and 316L.

Armco Steel Corp.

■

14 Plastic Pipe Booklet

"Carlon 'L' Rigid Plastic Pipe" is the title of a new four-page illustrated booklet describing various applications of the plastic pipe. Detailed information is presented on how sections of Carlon L are joined and how they are connected to metal fixtures or established metallic pipelines. Also included are dimensional drawings and descriptions of Carlon's plastic fittings, descriptions of the new compression coupling, and specifications for standard and extra heavy Carlon L in sizes from ½ in. to 2 in.

Carlon Products Corp.

■

15 Valve Catalog

A series of newly designed valves for use in agricultural fertilization and in industrial applications where ammonia and other gases, noncorrosive to steel, are used is described in a new Henry Valve catalog. Complete specifications and detailed information are presented.

Henry Valve Co.

■

16 Technical Bulletin

Failures in threaded pipe joints are discussed in a technical bulletin from Chicago Gasket Co., which also contains information on Graycote plastic sealing compound. While spiral leakage is perhaps the most common cause of threaded joint failure, the bulletin also describes and illustrates such causes as the natural porosity of metals, spiral tool marks, imperfect taper, and out-of-round pipe.

Chicago Gasket Co.

■

17 Bolting Bulletin

Taylor Forge & Pipe Works has issued Bulletin 524, "Modern Steel Bolting for Piping and Pressure Vessels," which was first presented at a meeting of the ASME. Comments on each ASTM specification are given plus tables on the compilation of properties and bolting selection. Also included is a discussion on the behavior of bolted flanged connections of the type used in piping and pressure vessels.

Taylor Forge & Pipe Works

Thermally Thinking

Continued from page 26

and developing a market for that product unless it bears the AGA Seal of Approval. Therefore, if we are so rigid in our thinking from the standpoint of our requirements, and new ideas developed by our research are stifled at the point of manufacture, we certainly haven't accomplished much. Industry research such as that carried on by this group only becomes valuable to the industry if it is translated into equipment or methods which can be used by our customers. Therefore, I think it is most important that all branches of the industry make it as easy as possible for our manufacturers to make use of our research and to develop new equipment and products for our customers."

Mortgages for gas ranges

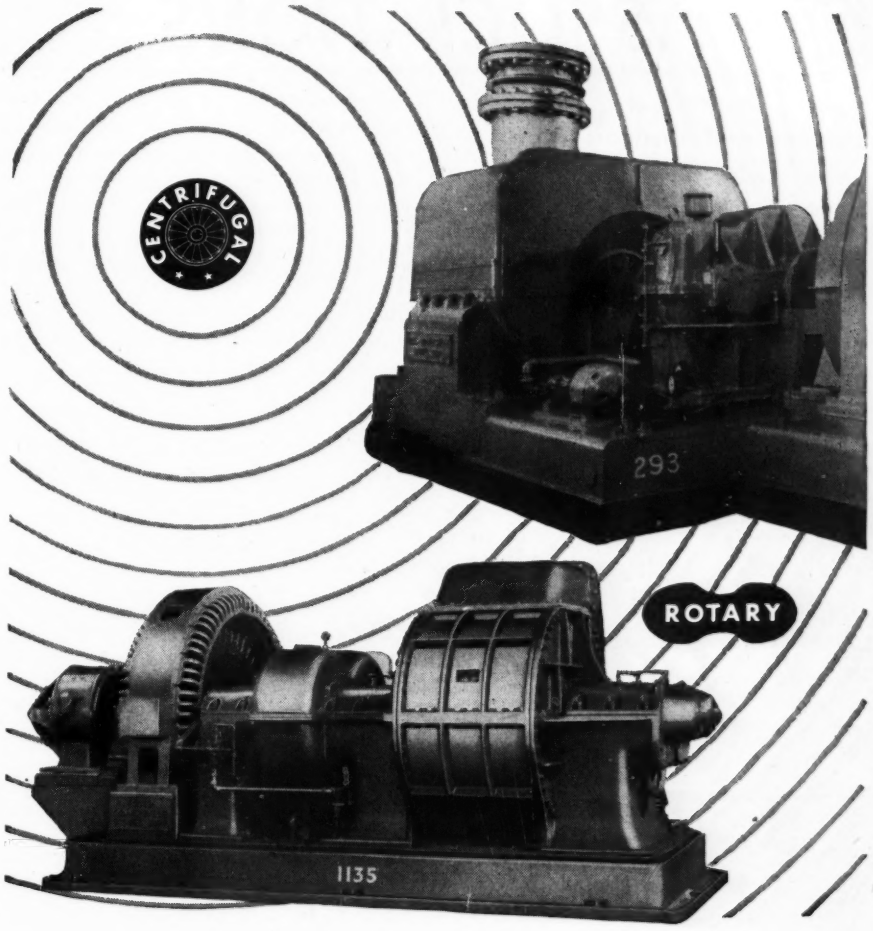
Anybody here interested in peddling a larger share of gas appliances?

Arthur Goldman, research director for *House & Home,* proposes the use of the open-end mortgage to turn the trick. Says not many people are using it, but that it has a real potential.

It's touted as a "natural" for the remodeling field, since there are 20,000,000 homes in the nation over 30 years old, and presumably a lot of them are in need of modernization—including new appliances. The idea, of course, is to sell appliances and tack the payments onto the mortgage—thus "stretching the homeowner's dollar from three to six times as far as traditional consumer credit with much greater safety."

Mr. Goldman, who expounded his views on the subject for the benefit of GAMA's fourth annual gas range conference, recommended that utilities and dealers check around to see which mortgage institutions write open-end mortgages, then join in an ad and promotional campaign—direct mail pieces, joint ads, displays, etc.—promoting the idea of "so much per month." List price tags, of course, would have to go.

Sounds good, all right, if the mortgage hasn't too long to run. For how are you gonna promote the 10-year turnover when your range has a 15-year mortgage?



ONLY THE BLOWER *Specialists*
BUILD THE DUAL-ABILITY LINE

To meet the varying problems of handling air or gas, in industrial processes, Roots-Connersville builds two complete lines of blowers and exhausters—Rotary Positive and Centrifugal. Together, they cover capacity requirements from 5 cfm to 100,000 cfm in single units. Centrifugals are available in multi-stage units, as illustrated, or in single-stage types.

Thus, this exclusive *dual-ability line* permits selection (without prejudice as to types) to meet the needs of most moderate pressure applications. Regardless of their sizes or types, R-C Blowers are unmatched in reliability, operating economy and long-time performance. Built into them is almost a century of specialized experience in handling gas and air, which is our exclusive business.

In addition to blowers and exhausters, R-C products include a wide range of gas and vacuum pumps, meters, inert gas generators and other related equipment. So, whenever you have a need for moving or measuring gas or air, we suggest consultation with the R-C Specialists.

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ASSOCIATIONS

Safety and plastic pipe attract distribution men

"Safe design to prevent overpressuring" and plastic piping for gas distribution were the big attractions for the more than 1000 distribution men who gathered in Chicago April 13-16 for the annual AGA distribution, motor vehicles, and corrosion conference.

More than half the near-record attendance crowded the two luncheon conferences on alternate days in which these subjects were featured, despite the widespread interest in other, parallel sessions on meters and metering, corrosion, construction, and motor vehicles.

The plastic piping session, chairmanned by Gordon Dye of Southern California Gas Co., Los Angeles, brought to light some strong and basic differences of opinion among the many manufacturers and extruders present. An AGA subcommittee on standards, which Mr. Dye heads, has been working to develop recommendations on methods of jointing and connecting tubing, as well as on standard pipe sizes. The source of contention was the double-barreled question of pipe sizing and jointing, with one group of manufacturers having developed certain "standard" sizes. Considerable uncertainty as to desired sizes and methods of coupling was evidenced both by manufacturers and utility men.

A. D. Simpson Jr., United Gas Corp., Houston, reviewed some of the preliminary thinking in regard to proposed standards. The committee has developed questionnaires which it is sending to selected utilities to establish their needs and preferences.

John F. Fugazzi of Denver reported results of a survey he has conducted on "Experience to Date With Plastics in the Gas Industry." Warren G. Swisshelm of the Clopay Corp., Cincinnati, a member of the Dye subcommittee, presented a paper on "Physical and Chemical Properties of Plastic Pipe Materials" as a report from several manufacturer members of the Society of the Plastics Industry.

The safety panel was moderated by W. P. Dick, United Fuel Gas Co., Charleston, W. Va., and had as panelists D. G. Findlay, Iowa-Illinois Gas & Electric, Fort Dodge, Iowa, and L. C. Rohret, Middle West Service Co., Chicago. Ventilating of regulator pits, oil seals, and overriding regulators were three topics covered in considerable detail during the session.

Corrosion round tables brought out some lively discussion on corrosion mitigation practices, under the skilled direction of F. E. Kulman, Consolidated Edison of New York.

Registration for the four-day affair totaled 1100. The man responsible for running the show was J. M. McCaleb, chairman of the distribution committee.

Several selected papers from the meeting are presented in this issue.

Lower price or better value is challenge of buyers

"Every requisition, especially for production material, is a challenge to us to do a better buying job by securing a lower price or securing better value for the money spent," C. Warner McVicar, director of purchasing and traffic for Rockwell Manufacturing Co., Pittsburgh, told the 83 purchasing agents who registered for the national purchasing and stores conference in Milwaukee recently.

According to his own experience, Mr. McVicar reported that a purchasing manual has helped Rockwell to meet that challenge and he proceeded to outline the 21 sections that comprise Rockwell's manual in his talk on "The Value of a Purchasing Manual to Purchasing and Management."

The movement to standardize the packaging of materials used in large quantities by the gas industry was reported on by L. R. Michelsen, Peoples Gas Light & Coke Co.

PLUG *Corrosion Leaks*—

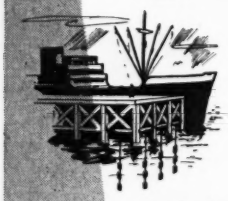
IN

UNDERGROUND or SUBMERGED METAL STRUCTURES

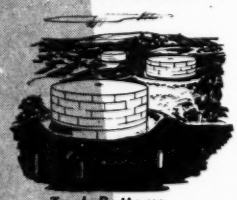
with

Spectrographically analysed

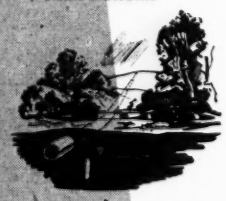
MAGNESIUM ANODES



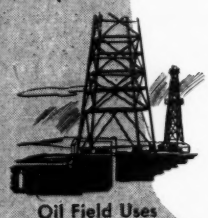
Marine Installations



Tank Bottoms



Pipelines



Oil Field Uses

Pipeline Anode Corporation's uniform quality AN-SPEC anodes represent years of experience, research, development and practical application of magnesium to arrest corrosion on metallic structures. AN-SPEC features include: CYLINDRICAL SHAPE for longer life, more efficiency; GUARANTEED HIGH PURITY—spectrographic analysis furnished with all anodes; SPECIALLY COMPACTED BACKFILL. Pipeline Anode Corporation gives prompt delivery on any size or shape anode required.

AN-SPEC anodes manufactured by Magnesium Division of M. J. Crose Manufacturing Co., Inc.

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The subcommitttee of the material and supplies committee, investigating the subject, is of the opinion that the adoption of standard packages would effect saving of store space, handling time, inventory time, and result in accuracy and safety. A packaging program was inaugurated in 1950 and since that time a survey of participating companies reveals that these advantages have been realized.

Harold T. Belcher, Consumers Power Co., summarized questions on material standardization that had been asked members of the purchasing and stores committee. Reported functions of the standards group included the setting up of standards in material specifications, equipment and design, and the checking to determine that these requirements had been met in the purchase orders and in the goods delivered. Also included is the investigation of new materials on the market to determine if they are applicable to a system of standards and the assisting of the operating and engineering departments in the ordering of new items.

Improve dealer relations, SGA conventioneers urged

Nearly 1700 delegates from 14 southern states and visitors from all over the nation who converged on New Orleans on May 11 for the 45th annual three-day convention of the Southern Gas Assn. were urged to set out immediately to improve their relations with gas appliance dealers by Harold P. Bull, national sales manager for Bendix Home Appliances, South Bend, Ind.

A point-by-point program to strengthen the ties between utility and dealer was set out by Mr. Bull during the residential sales session. The program includes education and training for the dealer's appliance salesmen, better demonstrations, cooperative advertising, free hook-ups on dealers' floors, low flat-rate installations, free display service, cooperation with promotions at the local level, home service, dealer publicity in utility advertising, and adequate manpower.

Jean Hughes, home service advisor for United Gas Corp. at Houston, described her department's Junior Achievement program which won additional benefits for her company when the JA company won a national award (see *GAS*, March, p. 52). In another sales session, H. C. Webb, vice president in charge of sales for Oklahoma Natural Gas Co., Tulsa, outlined the national dealer sales program being sponsored by the American Gas Assn. "The dealer is the key," he said, "to our continued growth and progress. I believe that this program of an active and strong dealer cooperative effort will pay off in increased gas appliance sales and bigger gas loads."

Edwin L. Hall, director of the AGA laboratories in Cleveland, told the residential sales session to sell the glamour of modern living to get the quality market and to concentrate on selling top-grade merchan-

THE NORMAC
BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

6 inch Normac Clamp being lowered into hole for installation

6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.

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Speakers' table at the SGA convention, from left, C. I. Wall, West Texas Gas, newly elected 1st vice president; Robert R. Suttle, SGA managing director; C. H. Zachry, Southern Union; W. L. Woodward, Zenith Gas system; R. A. Puryear, Alabama Gas. H. K. Griffin, behind Mr. Puryear, is the newly elected president.

dise, "the kind that makes every housewife feel like a queen."

A three-point key to a more effective personality—knowledge, confidence, and courtesy—was given during the employee relations session by Dr. Arthur Secord, supervisor of adult education at Brooklyn (N. Y.) College.

General session speakers were AGA President Frank C. Smith, who challenged SGA members to join in the coordinated nationwide sales and service program aimed at swelling the market for natural gas and appliances; SGA's outgoing president, John H. Wimberly, who told the convention how each segment of the industry could take part in a long-range program to increase its residential business; and Sen. George A. Smathers (R.-Fla.).

H. K. Griffin, vice president of the Mississippi Valley Gas Co., Meridian, was elected president of the SGA and Charles I. Wall, president of the West Texas Gas Co., Lubbock, was named 1st vice president.

New chairmen include Curtis M. Smith, Tennessee Gas Transmission Co., general chairman for the 1954 convention; Harold G. Gray, Empire Southern Gas Co., accounting section; L. J. Fretwell, Oklahoma Natural Gas Co., sales section; Joe C. Darrow, Lone Star Gas Co., distribution section; and Kenneth Fellows, Houston Natural Gas Corp., employee relations section.

In addition to the regular awards given to each section chairman, special presentations were made to President Wimberly (vice president of Houston Natural) and to C. H. Zachry, Southern Union Gas Co., chairman of the advisory council.

Attendance at the meeting set another new record, surpassing last year's turnout by more than 200 delegates.

Better cooking equipment would help cost problems

One way the rising costs in the restaurant field can be cut is through the use of better cooking equipment, J. Fred Vollmer, vice president of Stouffer's in Philadelphia, told nearly 300 attendants at the 1953 sales conference on industrial and commercial gas held in Philadelphia in April.

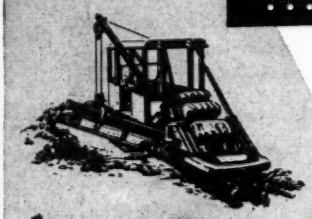
An an example Mr. Vollmer, who is also president of the National Restaurant Assn., cited deck ovens, stating that the manufacturers should take the initiative and upgrade their equipment so that only the best would be available to the trade.

In telling how the equipment dealer feels about gas industry promotional and sales

It takes a FULL team

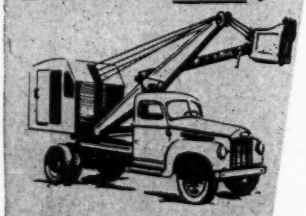
. . . whether it's fire fighters

. . . or digging equipment



1. This is for big jobs

2. This is for medium jobs



3. Sherman for all other jobs

On many excavating jobs the use of big equipment is costly and time-consuming. The Sherman Power Digger is designed so that you get all the advantages of power digging on these jobs. Thousands of users have proved that the Sherman Power Digger reduces costs. Write today for descriptive literature J.3.

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Sherman
PRODUCTS, INC.
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Sherman SP Products

CALENDAR

June

8..AGA Board of Directors — Virginia Beach, Va.
12..NEGA Heating Group of Industrial Division—Hampshire House, Boston.
14-18..Canadian Gas Assn.—Windsor hotel, Montreal.
19..NEGA Sales Managers Conference & Manufacturers Div. — Wachusett Country Club, West Boylston, Mass.
21-23..Wisconsin Utilities Assn. Accounting Section — Schwarts Hotel, Elkart Lake, Wis.
22-23..Michigan Gas Assn.—Grand hotel, Mackinac Island, Mich.
23..NEGA Accounting Div. — Wachusett Country Club, West Boylston, Mass.
23-26..American Home Economics Assn. — Kansas City, Mo.
26..NEGA Commercial Group of Industrial Div. — Sheraton-Biltmore, Providence, R. I.
29-30..AGA Residential Gas Section, New York-New Jersey Regional Gas Sales Conference — Monmouth Hotel, Spring Lake, N. J.

July

13-17..Western Summer Radio-Television & Appliance Market — Western Merchandise Mart, San Francisco.
13-17..National Housewares & Home Appliance Manufacturers Exhibit — Auditorium, Atlantic City.

August

24-26..Appalachian Gas Measurement Short Course — West Virginia University, Morgantown, W. Va.

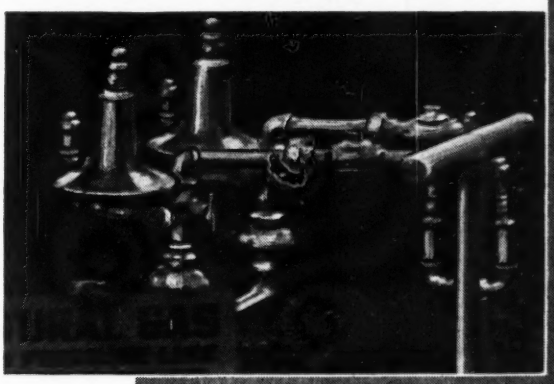
September

9-11..Pacific Coast Gas Assn. Annual Convention—San Francisco.
10-11..Midwest Gas School and Conference — Iowa State College, Ames.
11..New Jersey Gas Assn. — Spring Lake, N. J.
28-29..Independent Natural Gas Assn. of America Annual Meeting — Shamrock Hotel, Houston.

October

6-7....Texas Mid-Continent Oil & Gas Assn. — Rice Hotel, Houston.
7-9....NACE South Central Region — Mayo Hotel, Tulsa.
19-21..35th Annual Meeting, American Standards Assn.—Waldorf-Astoria, New York.
19-23..National Metal Exposition—Public Auditorium, Cleveland.
19-23..National Safety Council — Conrad Hilton, Congress, Morrison, and Sheraton hotels, Chicago.
26-28..AGA Annual Convention — Kiel Auditorium, St. Louis, Mo.

A WIDER RANGE
... of Delivery Pressure Control



REYNOLDS HIGH PRESSURE LINE REGULATORS in parallel hookup have an increased range of capacity as well as a wider range of delivery pressure control. This also provides greater margin for emergencies. On inlet pressure the range is up to 650 pounds. For outlet pressure, this unit assures absolutely accurate and dependable control from 2 to 100 pounds. This variance in outlet pressure is made by use of different sizes of diaphram cases and further flexibility in the spring type is possible by use of different strength springs.

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GAS CONTROL SINCE 1892

AUTOMATIC INCINOR
GAS-FIRED INCINERATOR

A "MUST" in Homes with Automatic Heat
A FULL-PROFIT LINE • NO TRADE-INS
INCINOR IS APPROVED BY A.G.A. LABORATORIES
ACT NOW FOR COMPLETE DETAILS
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campaigns, Bryce C. Roby, president of the Food Service Equipment Industry Inc., said that dealers today welcomed any sales effort on the part of utilities and pledged full cooperation by his organization in the coming "PEP" commercial cooking promotion campaign.

Du Pont's Dr. Alfred C. Mueller, speaking on heat applications in the chemical industry, presented tabulations showing how they arrive at costs of operations to determine the fuel for a particular processing operation. His talk indicated that more time and effort should be given to getting gas and gas equipment accepted in the original plant design of large organizations and secure the potential gas load in the chemical industry as well.

During a panel discussion on automatic lighting of commercial equipment, it was indicated that although automatic lighting is desirable, at present it should not be made mandatory and that any mandatory decision should come for customers' demands.

GAMA's code of ethics for industrial gas equipment manufacturers was presented by A. V. Leudemann, Mears-Kane-Ofeldt Inc. This code, designed as a companion to the AGA seal of approval on commercial equipment, was developed because there can be no approval requirements for custom built industrial equipment.

Also on the industrial side of the program was the presentation by Carl Wierum, Brooklyn Union Gas Co., and Lawrence R. Foote, Bryant Industrial Div., Mr. Wierum setting forth the case for the gas utility and Mr. Foote the manufacturer on industrial gas equipment service as a sales aid. They were both in accord that service should be rendered, some by the utility and some by the manufacturer, depending on the particular situation, the locality and the availability of gas company and manufacturers' representative.

Measurement short course attracts 1000 attendants

Keynoter Thomas F. Cartwright, Amarillo Oil Co., told approximately 1000 attendants at the Southwestern gas measurement short course in April that "natural gas pastures are greener than ever" for a man seeking an industrial career. Forecasting that in a few years there will be two jobs in natural gas for every one there is now, Mr. Cartwright cited figures showing the vast postwar expansion in natural gas production and distribution.

A construction program involving $1.5 billions will be completed by 1956, and an annual output of 15 trillion cu ft is seen by 1975, he pointed out. The industry now has 129,000 employees averaging $3840 a year, for a total payroll edging close to $500 million, compared with 98,500 workers averaging $2840 in 1947. He noted that most of the southwestern measurement men among those 129,700 have been through the University of Oklahoma's short course and declared that there "is no single institution to which the gas industry owes more . . ."

About 100 specialists from the industry presented one-hour classes in the machines and methods controlling gas pressure. The short course, 28th in the series, is sponsored by the University of Oklahoma's engineering college with help from eight industrial commissions and associations. Engineering Dean W. H. Carson heads the executive committee; T. S. Whitis, West Texas Gas Co., Lubbock, is general committee chairman; and Paul H. Miller, Texas Eastern Transmission Corp., Shreveport, was in charge of this year's program.

Enthusiasm expressed over industry's unifying program

Almost unanimous approval has been received from executives who have heard the 9-point program recommended by AGA and the 15-point program of GAMA for unifying the industry in a campaign to increase and upgrade sales of gas appliances. So reported AGA President Frank C. Smith during the Midwest regional gas sales conference in Chicago late in May.

Executives representing more than half the meters in the country have attended nation-wide meetings to learn of the program and, in turn, to present it to their

HALFWAY AROUND THE WORLD...

with CARBOSEAL Trade-Mark ANTI-LEAK

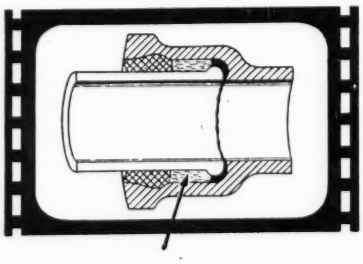
Distributors of dry gas have bought enough CARBOSEAL anti-leak to leakproof 13,000 miles of 3-inch equivalent main. And the first bell-and-spigot joints treated with CARBOSEAL anti-leak—20 years ago—are still tight.

CARBOSEAL anti-leak is effective and lasting when unaccounted-for gas increases after changing over to a dry gas. It swells the fiber packing in a bell-and-spigot joint as much as 44 per cent of its dry volume. This swollen condition lasts, because CARBOSEAL anti-leak doesn't evaporate to any extent.

CARBOSEAL anti-leak is easy and economical to apply. You don't have to uncover every joint—just pour the anti-leak into graded mains at the high points, or spray as much as 300 feet of main from one opening with a hose and nozzle.

The cost of enough CARBOSEAL anti-leak to treat 1 mile of 3-inch equivalent main is about $100!

Get all the facts—write for our booklet, Form 4506.



SEE AND HEAR

. . . the whole story. Write today for our free 16 mm. color-sound movie that shows how two gas companies used CARBOSEAL *anti-leak.*

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"Carboseal" is a registered trade-mark of Union Carbide and Carbon Corporation.

own neighboring companies. Mr. Smith pointed out that salesmen and their training are highly necessary factors. The AGA dealer sales committee has been busy preparing a dealer sales training program which will be ready for presentation soon.

The respective merits of electric ignition systems and single point gas ignition systems were presented during a general session. Floyd M. Rosenkrans, Gas Service Co., Kansas City, revealed that his company now has more than 9000 gas ranges with complete automatic electric ignition on its lines and, significantly, that the sale of electric ranges in that territory declined last year. In the same discussion, Bernard H. Wittman, Peoples Gas Light & Coke Co., Chicago, explained the reasons behind his company's choice of the single-point, flash-tube ignition system for the ranges it was promoting. No conclusions were sought in the discussion, as the results of the AGA field tests to develop the "cold range" will be published shortly.

According to Robert J. Canniff, Chicago advertising and sales promotion consultant, dealers now sell 76% of all ranges, 81% of all water heaters, and 52% of all refrigerators sold today. Twenty percent of these outlets do 80% of the total volume of appliances. Therefore, the dealer must be recognized as a major source of sales, and coordinated effort is essential for increased gas appliance sales.

Management's interest in each employee stressed

In the keynote address at the 5th national personnel conference of the gas industry held in Chicago in April, James F. Oates Jr., Peoples Gas Light & Coke Co., suggested that "in fixing standards or values you must believe in the dignity and sanctity of human relationship, you must have confidence in the man, and you must also consider his importance." All levels of management must have a sincere interest in each employee as a fellow human being, he said.

Eighty executives of gas utilities and pipeline companies heard Dr. Irving J. Lee, professor of public speaking at Northwestern university, speak on "Barriers to Communications," a talk that discussed the major obstacles people encounter in getting ideas across to one another.

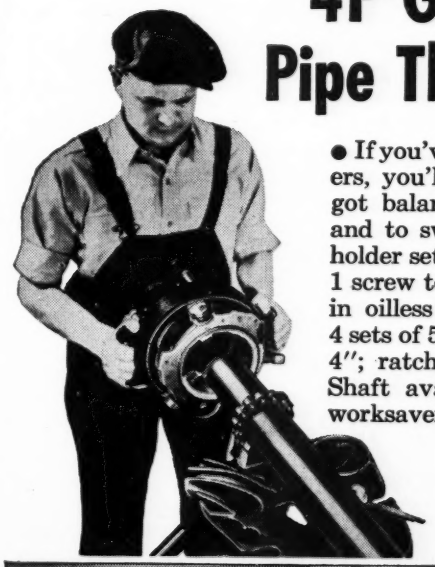
A realistic approach to the problem of a balanced employee benefit program was made by J. H. Shreiner, of Towers, Perrin, Forster & Crosby Inc., when he suggested that pension plans be on a company pay-all basis because this type of plan would not reduce the take-home pay of employees.

L. A. Brandt, vice president in charge of industrial relations of the Peoples Gas Light & Coke Co., was chairman of the committee on arrangements of the two-day meeting that is sponsored by the personnel committee, Great Lakes Personnel conference and Midwest personnel conference of the AGA, and the employee relations section of the SGA.

Never before one so easy to carry—
easy to put on pipe...

RIDGID

4P Geared Pipe Threader



● If you've rassled with old-style geared threaders, you'll go strong on this RIDGID 4P. It's got balanced loop handles—a cinch to carry and to swing onto pipe. Mistake-proof workholder sets to size before it's put on pipe—only 1 screw to tighten. Easy upkeep—drive pinion in oilless bronze bearing; safe enclosed gear. 4 sets of 5 high-speed steel dies, 2½", 3", 3½", 4"; ratchet handle. RIDGID Universal Drive Shaft available — also 4P for conduit. Buy worksaver 4P at your Supply House.

THE RIDGE TOOL COMPANY
ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

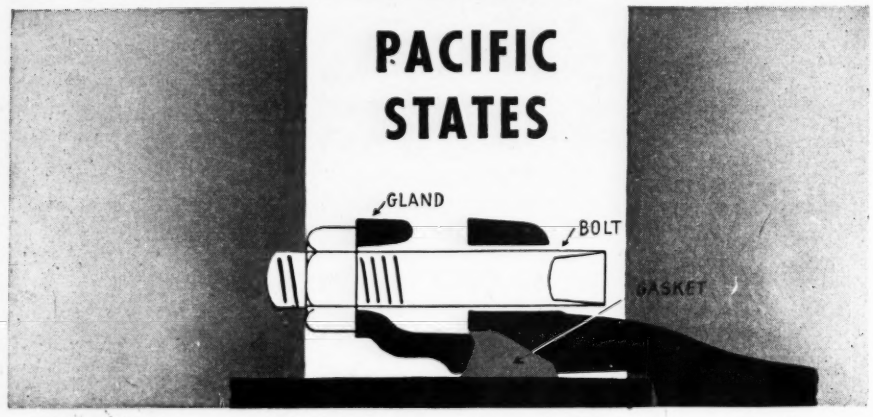
Association notes

AGA President Frank C. Smith will be one of the principal speakers at the 46th annual meeting of the Canadian Gas Assn. scheduled for Montreal, Quebec, June 15-18 at the Windsor. An attendance of approximately 300 is expected.

S. F. Wikstrom Jr., formerly of Mississippi Valley Gas Co., has joined the AGA's staff as promotional representative for the southern territory. Also new to the promotional staff is Chester Wegener, on loan from the Brooklyn (N. Y.) Union Gas Co., as a special service representative, to continue the work of James F. McNally, who has rejoined Brooklyn Union in the publicity and advertising department. Charles R. Bowen has joined the American Gas Assn. headquarters staff in New York as assistant manager of the New Freedom Gas Kitchen program. He was formerly with the public relations and advertising department of Prudential Insurance Co.

Herman Koester Jr., vice president of W. Wirt Young & Associates, Wellesley Hills, Mass., has been named chairman of the industrial division of the New England Gas Assn. As a result of his chairmanship, he also becomes a director.

McWANE
PACIFIC
STATES



"BOLTITE" *Means*—
BOTTLE TIGHT

McWane-Pacific Boltite Cast Iron Pipe has a flexible yet bottle-tight joint, of the stuffing box principle. A thick gasket is compressed in the stuffing box by a bolted follower-ring or gland. Gaskets furnished in special rubber compound, asbestos or other materials. Boltite is an ideal pipe joint for water, gas, steam, oil, chemicals or other liquids. Bolts and glands are special high strength cast iron which last as long as the pipe itself.

ONLY TOOL NEEDED
RATCHET WRENCH

One man makes Boltite joints, using only one tool—a ratchet wrench. All he does is socket the spigot in the bell, slip the gasket into the stuffing box and then tighten the bolts on the follower-ring. Saves time, labor and money. For further details, write.

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Provo, Utah

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Portland 4, Oregon.....501 Portland Trust Bldg.
Salt Lake City.....Waterworks Equip't Co.
Seattle, Wash.....Smith Tower Bldg.

NEWS

Appliance sales stopped by Mississippi Valley Gas

Mississippi Valley Gas Co. is discontinuing entirely the sale of gas appliances and equipment because, according to Charles M. Broad, general sales manager, exhaustive studies have indicated that best results are obtained in areas where dealers enjoy exclusive sales territory without utility competition.

Hereafter, customers of the utility wishing to buy appliances will be referred on an equitable basis to appliance dealers, who will be given special assistance by Valley Gas in promoting gas appliance sales in Columbus and other cities in its system.

Mr. Broad said that the new dealer program calls for special assistance to dealers through an expanded home service staff, increased newspaper and radio advertising budgets, company dealer representatives, incentive dealer prizes, and special mailing services.

Valley Gas sales floors will be made available for appliance displays by dealers and special research and marketing departments will make periodic surveys of the area's sales market to provide dealers with statistical information.

Practical TV package offered by Caloric

Designed to put TV merchandising on a practical level for even the smallest gas utility, "Operation Blue Flame" has been produced by Caloric Stove Corp., Topton, Pa., to provide a medium for local merchandising on a nationally prominent television program with a well-known star.

Dione Lucas, famous culinary artist, is the focal point of the packaged campaign, which has the endorsement of the AGA. The plan, already in full swing, supplies utilities joining the Blue Flame network with specially made films of the Lucas show, with personalized commercials by the artist herself. The finished product of each utility is its own cooking show, telecast on a local station at a time of the sponsor's choosing, with all the advantages of national publicity and advertising.

The Dione Lucas Show has been jointly sponsored by the Brooklyn Union Gas Co. and Caloric in the New York area for more than two years, and in that time has drawn one of the largest and most loyal TV audiences of any daytime cooking show. In April Philadelphia Gas Works and a group of 19 gas utilities in the Boston and Providence area introduced filmed versions of the program. Utilities now in the network serve more than 2.5 million gas customers.

To build an audience for the new show, slides and film trailers have been prepared for use on the local stations. A participating

Discussing sales target for Philadelphia Gas Works Operation Blue Flame are James Nichols, general sales manager, and Dione Lucas, star of the industry's new TV show, at a press party held in Philadelphia.

gas company receives periodic publicity releases and promotion material; recipe columns are prepared for use in newspapers, and photographs and ad mats are also provided. Also, Caloric's national advertising will make prominent mention of Dione Lucas.

Northwest gas companies seek merger approval

Plans for merger of gas companies which serve nine cities in Washington, Oregon, and Idaho have been filed with the Securities & Exchange Commission. Stewart Matthews and Sanford Berry, the chief figures in the merger project, said they also propose to extend gas services to other cities.

The plan calls for the Cascade Natural Gas Corp., incorporated in January by Mr. Matthews, to take over the Northwest Cities Gas Co., of which Mr. Berry is president. A possible merger of the Bremerton, Wenatchee, and Bellingham Gas Co.'s (of which Mr. Matthews is president) with the Cascade company was announced several weeks ago.

The cities served by the companies involved include Bremerton, Bellingham, Wenatchee, Walla Walla, Yakima, and Clarkston, Wash.; Lewiston, Idaho; and Pendleton and Eugene, Ore.

Code of ethics adopted by GAMA industrial division

Finding it impossible to write a set of standards which would cover the more than 25,000 different uses of gas equipment in American industry, GAMA's industrial division members have adopted a code of ethics. By displaying the seal on their products, members agreed to comply with the self-policing action that sets forth the following terms:

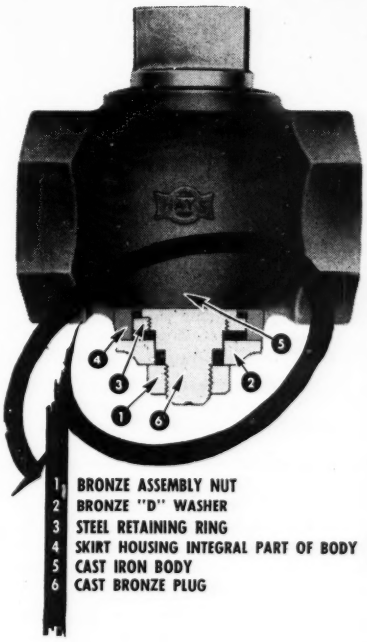
Product design based on sound engineering principles and proven research, and em-

More and More are in service...

HAYS®

TAMPER-PROOF GAS STOPS

BECAUSE OF THESE FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
- Obtainable in a Variety of Patterns.

AVAILABLE IN
Black or Galvanized
Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing
Sizes; ¾"—1"—1¼"—1½"—2"

Write for Folder 120-C D

Also HAYS STANDARD
HEAVY PATTERN IRON BODY GAS STOP

For Over 80 Years the Gas Industry has relied on HAYS Iron Body Gas Stops

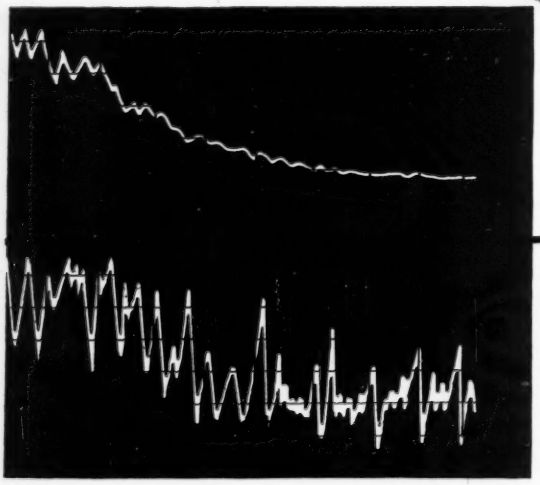
HAYS GAS SERVICE PRODUCTS
HAYS MANUFACTURING CO., ERIE, PA.

A. V. Leudemann (left) presents seal of GAMA's industrial equipment division to F. C. Schaefer, division chairman.

ployment of superior workmanship and materials; assignment of accurate and dependable input and output ratings to all products; design and construction with a view to satisfactory product performance over a reasonable expected lifetime; readiness to cooperate in preparation and application of official standards, when and if promulgated by the American Standards Assn.; application of highest standards of safety and durability to the selection of controls and accessories used in finished products; furnishing of carefully prepared directions, wherever practicable, to assist installers and users.

When presenting the code at the AGA's recent industrial sales conference, A. V. Leudemann, representing GAMA's industrial division, pointed out that the code further provides that, on presenting their qualifications, manufacturers of industrial gas equipment "shall make only such representations as are consistent with integrity and the highest standards of our industry and shall . . . avoid false or misleading statements with respect to grade, quality, design, construction, or performance of our products."

Lancaster puts the finger on friction



Cardiograph Reading On New Lancaster Metal Rim Diaphragm indicates no points of excess friction —uniform distribution of leather, perfect alignment of center pans, ideal weight and stiffness of leather, and proper amount of oil in leather.

Cardiograph Reading On New Diaphragm of Another Make (as received in proof) indicates excess friction. If installed in this condition, diaphragm would come in from 5% to 10% fast. (Diaphragm was later found to have non-uniform distribution of leather and center pans improperly aligned.)

The new cardiograph, recently designed in our development laboratories, opens the way for new engineering improvements in gas meter diaphragm design and construction. It is typical of Lancaster's leadership.

Accurately checking differential of pressure under actual meter operating conditions, Lancaster's new cardiograph puts the finger on flaws even when the meter is in proof. Excessive wrinkles in leather, uneven diaphragm, off center pans, collapsed diaphragm, excessive oiling and other factors influencing diaphragm performance show up on the graph.

Compare the above graphs and you'll see why the quality features of Lancaster Metal Rim Diaphragms are so important for friction-free meter performance and longer service life.

METER PARTS CO.

Scholarship awards set up by Michigan Gas & Electric

The Richard and Hinda Rosenthal Foundation has been established by the Michigan Gas & Electric Co., Three Rivers, Mich., as a program of scholarship awards for high schools graduates wishing to pursue education at higher levels. The awards are available only to the children, brothers, and sisters of Michigan Gas employees.

Awards by the foundation will be made upon the basis of scholastic records in high school, recommendations of school and community leaders, and a brief competitive examination. Several awards, ranging in amounts from $200 to $500 each, will be made for the 1953-54 academic year.

In addition, Michigan Gas is establishing a program of making available subsequent on-job training in summer months for those who have received scholarship awards.

Sixty-day extension given Consolidated Gas rates

A 60-day extension has been granted Consolidated Gas Utilities Corp., Oklahoma City, allowing the company to charge its customers in 45 Oklahoma towns an extra $2 million a year. (See *GAS*, May, p. 23.) A federal court originally issued a permanent injunction against the state's corporation commission permitting Consolidated to keep a new rate schedule in effect until May 6.

The extension represents a compromise agreed to by attorneys for both the company and the customer-cities who are protesting rate increases, pending a new ruling.

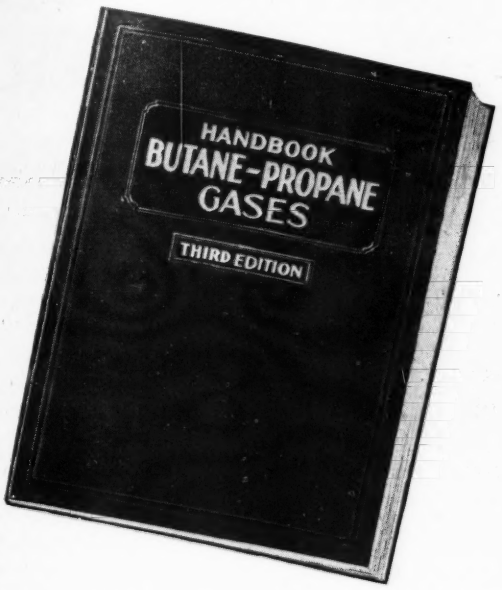
Under the agreement, Consolidated put up a $100,000 bond in May and will put up another $100,000 this month against any refunds that may be due customers as a result of a final ruling by the commission.

Equitable ties in with AGA in Carnival of Gas Cooking

Tying in with the nation-wide campaign of the AGA and gas range manufacturers, Equitable Gas Co. opened its 1953 carnival of gas cooking with gay balloons and giddy hats, off-key melodies on a hurdy-gurdy, and barkers calling out their wares—and with a goal of 240 gas ranges to be sold between April 6 and June 27.

During the campaign Equitable will use the theme "Only Gas Cooking Gives You . . ." in all its advertising, promotion acti-

The Only Complete Reference Book on Liquefied Gas Engineering, Installation and Operation



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CONTENTS

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Properties of the Hydrocarbons in L. P. Gas
Properties of Butane-Propane Mixtures
Volume Correction Factors
Analytical Determination and Testing
Fire Protection and Control

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Natural Gasoline Plants, Recycling Plants, Oil Refineries

PART 4. Transportation and Storage
Delivery by Truck, Rail, Water, and Pipe Line
Storage Tank and Pressure Vessel Design
Liquid Metering and Pumping Systems

PART 5. Distribution of L. P. Gas
Installing and Servicing L. P. Gas Systems
Semi-Bulk Systems
Bottled Gas Systems
Gas Utility Service from Central Plants
Multiple Utility Service from a Central Plant

PART 6. Utilization of L. P. Gas
Comparative Performance With Other Fuels
Appliance Installations and Testing
Domestic Applications
Commercial Applications
Industrial Applications
Enrichment, Peak Load, and Standby Uses
A Fuel for Internal Combustion Engines

PART 7. Regulations
N.B.F.U. Pamphlet No. 58
Motor Carrier Tariff No. 7
Freight Tariff No. 4
Unloading from Railroad Tank Cars
Marine Regulations

PART 8. Appendix
Interchangeability of Other Fuel Gases with Natural Gas
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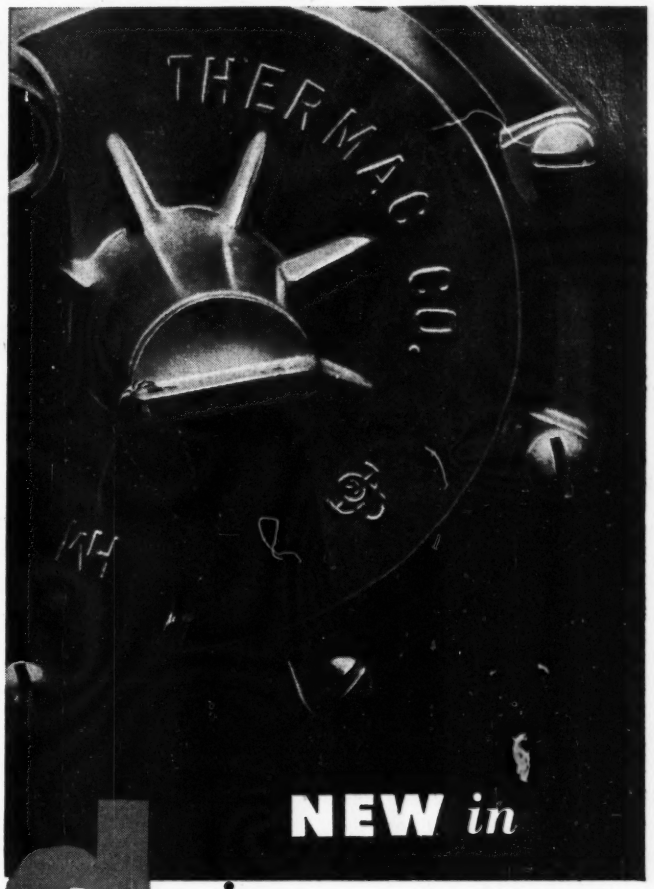
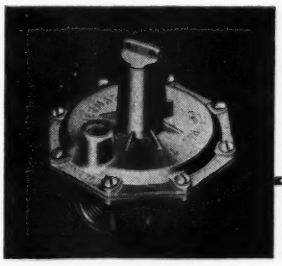


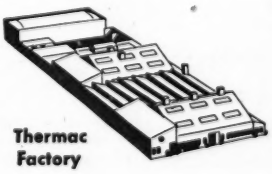
NEW in design-PERFORMANCE

Leadership in the industry demands that we constantly improve both our product and service. The new Thermac 8-sided Appliance Regulator achieves relatively larger effective diaphragm area with resultant higher capacities with relation to its outside dimensions. Greater sealing against diaphragm leakage, easier to install in tight spots, plus provision for vise grip are new special features.

Here in the new "T" Series you have a smaller regulator with more capacity at a lower price and of the highest quality obtainable. Send for our new catalog giving complete data.



Thermac "T" Series Appliance Regulator



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Johnsonite PLASTIC PIPE

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JOHNSONITE No. 4 has a smooth inner wall, which increases the rate of flow; does not attract sludge or rough particles; reduces settling, surge and back pressure.

Tests conducted on service lines which gas has passed for a period of over three years showed no apparent effect on this pipe.

GUARANTEED to last indefinitely in the most corrosive soil conditions.

JOHNSONITE No. 4 is so lightweight that one man can easily handle and install it. No machinery is required for cutting and installing this pipe.

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A complete line of fittings in all standard sizes.

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Gen. Pipe Size	Approx. Wgt. Per Ft.	Nominal O.D.	Cal. Burst P.S.I.
½"	.05 lb.	.60	830 lb.
¾"	.075 lb.	.855	600 lb.
1"	.135 lb.	1.14	600 lb.
1¼"	.20 lb.	1.42	600 lb.
1½"	.32 lb.	1.73	660 lb.
2"	.45 lb.	2.25	550 lb.
3"	.65 lb.	3.25	380 lb.
4"	1.00 lb.	4.10	360 lb.
6"	2.33 lb.	6.22	340 lb.

•

Write for Complete Catalog and Name of Nearest Dealer

JOHNSON PLASTIC CORPORATION

P. O. BOX 312 CHAGRIN FALLS, OHIO
DEPT. 55-C

"Pitchmen" Ray Little, Don Brashear, and Gil Smith gave their spiel on the campaign at the April 6 sales department meeting.

ities, demonstrations and cooking schools. Advertising for the campaign includes 40 gas range ads in Pittsburgh, McKeesport, Braddock, Homestead, and Monongehela newspapers, as well as the Courier and Polish weekly (see reproduction of ad). One ad was supplemented by six pages of dealer ads on fully automatic gas ranges. Radio spot announcements and gas bills also carry a gas range story.

To focus attention on featured ranges—Roper, Tappan and Universal—all district office sales floors are decorated in carnival style.

Equitable's range campaign is actually part of a promotion being conducted by the three natural gas companies serving the Pittsburgh area. Every effort has been made to bring dealers into community promotional efforts.

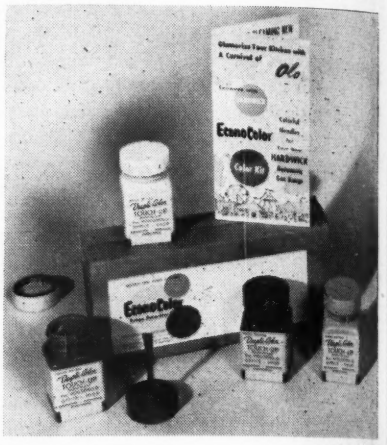
One of the newspaper ads used by Equitable during its Carnival.

Hardwick customers can paint own range handles

A "Carnival of Color" promotion featuring a free EconoColor kit and a deluxe Hardwick automatic gas range are being tied in by the Hardwick Stove Co., Cleveland, Tenn., with the AGA Carnival of Gas Cooking.

The color kit, which contains four jars of enamel with brushes attached, is offered free with the low-priced promotional range, and allows the housewife to choose the color she desires for the range handles. Dealers will receive the ranges with regular white enamel and chrome handles and Hardwick will send the kit direct to the customer.

Display cards, consumer folders, stickers, newspaper mats, radio spots, and publicity releases have been made available for dealers' participation in the campaign.



EconoColor kit with four jars of enamel and attached brushes enable women to enamel range handles the exact color they desire.

Peoples honors divisions for 1952 safety records

Three units of the Peoples Natural Gas Co., Pittsburgh, were honored recently for outstanding safety records.

Glenshaw City plant, receiving honors for the third consecutive year, worked 718,495 continuous accident-free manhours in 1952; Imperial (Pa.) compressing station, also receiving third-year honors, had 587,657 accident-free hours; and Armstrong Field district was honored for 538,362 hours without a mishap.

All appliance shipments up in first quarter

Substantial increases in gas appliance shipments during the first quarter of 1953 are revealed in recent statistics released by the Gas Appliance Manufacturers Assn.

Domestic range shipments during the period established an 11.5% increase over the same 1952 period, when shipments to-

you can count on SINCLAIR'S reputation for reliability

Sinclair's reputation as a supplier in the industry is your assurance of a *dependable* supply of a *uniform, high quality* LP-Gas. Moreover, you can confidently recommend Sinclair to industrial users who require standby Butane and Propane facilities.

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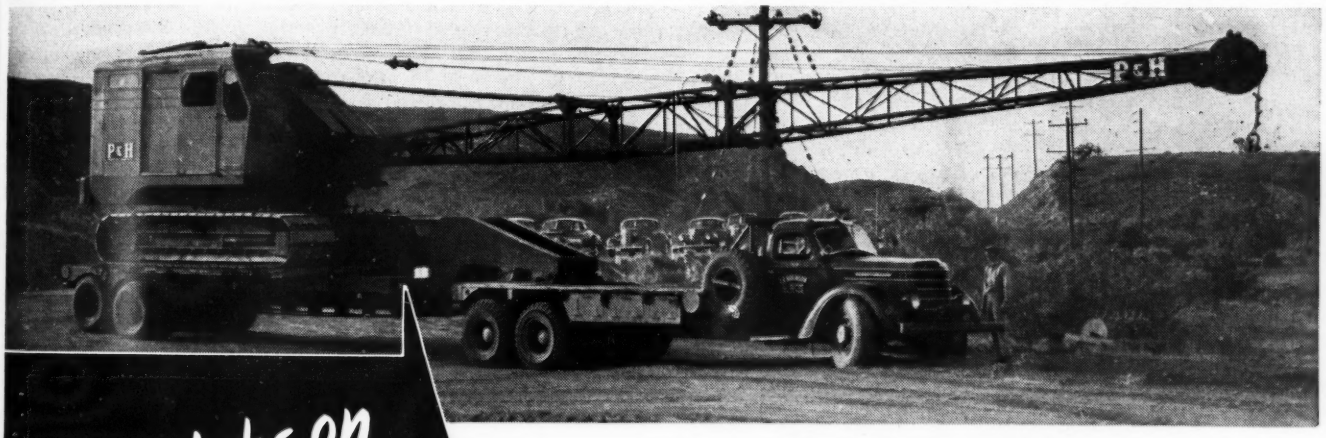

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To get equipment where it's needed, when it's needed, safely and efficiently, is no longer a major problem with contractors . . . they rely on Tulsa Winch to do the job. Whether you're moving power shovels or light timbers, there is a Tulsa Winch for every make and model of truck and crawler tractor in capacities from 6,500 to 80,000 lbs.

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TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

*Reg. U. S. Pat. Off.

taled 577,100 units and 517,500 units respectively. Shipment of 229,600 ranges during March made it the 10th consecutive month that unit shipments were greater than the similar months of the preceding year. Last year 185,200 ranges went out in March.

Industry shipments of gas-fired central househeating equipment during the first quarter of 1953 totaled 139,700 units, up 13.1% over last year. Gas-fired warm air furnaces are estimated at 102,500 (up 38.3%) while gas-fired boilers and gas conversion burners approximated 10,600 and 26,600 units, respectively, during the first quarter.

An increase of 29.8% was shown by automatic gas water heaters in the first three months of 1952, when 581,300 units were shipped. March deliveries numbered 206,400, the highest monthly total since March 1951 and a 34.6% increase over March 1952.

Industry accident rates down on two counts in 1952

Both the frequency and the severity of its accidents were reduced by the gas utility industry during 1952, when the industry had 14.40 disabling injuries to employees per million manhours worked, an improvement of 8.4% over 1951. This marked the fifth successive yearly decline, the AGA reports.

The severity rate, measuring days lost because of injuries per thousand hours worked, was 0.81% during 1952, or 22.1% better than the previous year. There were 18 deaths and one permanent disability in the gas industry during 1952, a decrease of 43% from a year earlier and the industry's second best record in two decades.

For the first time, the AGA has reported on automobile accidents; its survey of 1952 showed 1.84 accidents per 100,000 miles traveled by gas utility vehicles.

News notes

Ultimate customers during March 1953 bought 5385 million therms of gas from utilities, a gain of 0.8% over sales of 5344 million in the same month a year ago. The AGA's March index of total gas utility sales is 167.0% of the 1947-1949 average. For the 12-month period ending March 31, utility gas sales aggregated 53,003 million therms, a new peak. These sales were 6.5% higher than sales of 49,768 million therms in the previous corresponding cumulative period.

Alberta will get Canada's first gas turbine electric generator when Canadian Utilities Ltd. opens its 7000-kw unit at Vermilion. Its addition will almost double the capacity of the present natural gas-fired steam plant. The unit will cost approximately $560,000, with installation costs of about $620,000.

Title of the nation's most widely owned utility goes to Pacific Gas & Electric Co., San Francisco, a company tabulation reveals. One of the three largest firms in its field, PG&E also ranks eighth among all U. S. corporations in number of shareholders. It claims 198,330 "bosses" at the end of 1952, a gain of 9867; 66% of the stockholders are in the company's California territory.

Three hundred thousand shares of Philadelphia Electric Co.'s common stock have been reserved for sale to employees, a plan whereby employees may buy stock through payroll deductions. H. P. Liversidge, board chairman, said the stock purchase plan encourages thrift among employees and stimulates interest in the affairs of the company, a factor which contributes to better operations.

The Republic Supply Co. of California has been appointed distributor for Kralov Plastic Pipe Co., Los Angeles, increasing the line of plastic pipe, fittings, and accessories carried by Republic.

A new plant, devoted largely to production of Nordstrom valves, will be opened during the latter part of the year by Rockwell Manufacturing Co. in Sulphur Springs, Texas. The plant, which will serve the entire south and southwest, is of one-story brick construction and is entirely windowless, a design feature incorporated to provide controlled conditions in which to perform close tolerance manufacturing operations.

In spite of the declines in stock price levels which occurred generally during April, the composite price of natural gas company common stocks on April 24 was approximately 1.8% higher than a year earlier. The average dividend payment per share advanced 14.3% and the current composite yield of 5.19% on these stocks is 12.3% higher than the 4.62 yield during the comparable week in 1952.

Propane gas is to be stored in an abandoned tunnel owned by the Chesapeake & Ohio Railway near Charlottesville, Va. The railroad has leased the 4264-ft tunnel to the Bottled Gas Corp. of Virginia, which will seal off the tunnel and store the gas under 100 psi pressure during periods of low demand for the fuel.

Utility companies under jurisdiction of the California Public Utilities Commission have been sent copies of a guide to be used in determination of depreciation expense accruals. It presents essential elements of computing the straight-line remaining life depreciation accrual which are applicable to all classes and sizes of utilities.

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People

DALE B. OTTO is the new president and director of New Jersey Natural Gas Co. Other new board members are ALFRED LEE LOOMIS and JAMES J. MITCHELL JR. Mr. Otto was formerly vice president and general manager of the County Gas Co., Atlantic Highlands, N. J., which bought the gas division of the Jersey Central Power & Light Co. to form the present New Jersey Natural Gas Co.

Dale Otto
N. J. Natural

Fred Osborne
U. S. Pipe

FRED OSBORNE has been elected a vice president of United States Pipe & Foundry Co., Burlington, N. J. Last October when Sloss-Sheffield Steel & Iron Co. merged with U. S. Pipe, Mr. Osborne became president of the Sloss-Sheffield division.

ROBERT L. KIDD has been elected president of Arkansas Fuel Oil Corp. and A. H. WEYLAND president of Arkansas-Louisiana Gas Co., Shreveport. Arkansas Fuel also elected H. T. GOSS, J. A. WELCH, and EARLE G. CHRISTIAN vice presidents. P. J. ERICKSON JR., EARL P. FARMER, J. C. HAMILTON, and HARRY HANCOCK are new vice presidents of Arkansas-Louisiana.

The following appointments have been announced by Alabama Gas Corp., Birmingham: CHARLES B. GAMBLE JR., vice president in charge of engineering; HALCOTT P. JONES, vice president in charge of rate and regulations; and JAMES H. CHENERY, vice president in charge of sales.

JAMES M. VEEDER, assistant manager of the finance department of Koppers Co. Inc., has been elected a director of Montreal (Canada) Coke & Manufacturing Co., which is operated under Koppers management.

Servel Inc., Evansville, Ind., has named FRED G. KRACH to the new position of purchasing agent in charge of raw materials. His staff will include buyers ERWIN F. SCHMIDT, forgings and castings; WILLIAM A. GALLMEISTER, non-ferrous metals; and JERRY L. TROMLY, ferrous metals. The company has also named JOHN H. JENNINGS chief engineer in charge of all air conditioning activ-

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Air Conditioned
Fabulous new
Petroleum
Club
now on entire
top floor
"Houston's Welcome to the World" — that's The Rice — with 1,000 air-conditioned rooms . . . central downtown location . . . four fine restaurants, excellent cuisine . . . beautiful Empire Room, featuring nationally famous orchestras. Rates from $4.50 single and $6.50 double.
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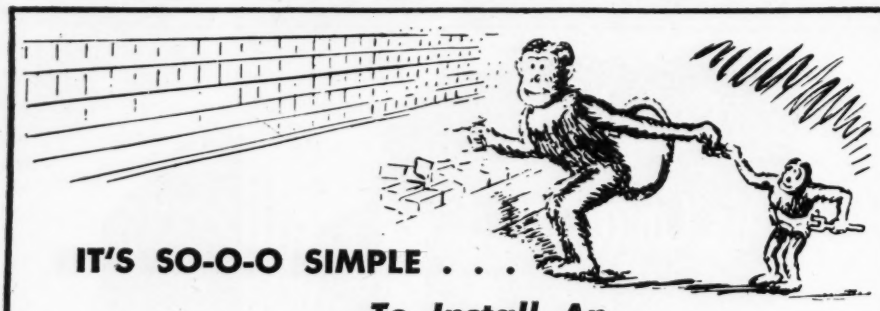

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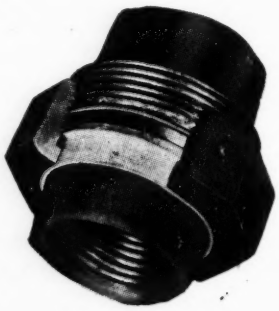

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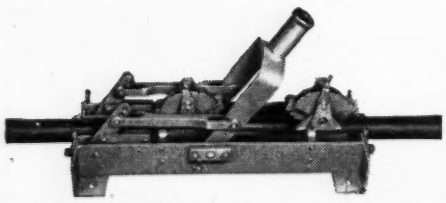

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ities; DR. EUGENE P. WHITLOW, assistant chief engineer for all-year air conditioning; and ED GEISHERT, assistant chief engineer for room air conditioners.

Selas Corp., Philadelphia, has announced the appointment of RICHARD S. VAN NOTE as manager of its Chicago office. He will serve as district sales manager for the Selas heat and fluid processing equipment.

R. S. Van Note
Selas Corp.

R. L. Conover
Equitable

RICHARD L. CONOVER has been appointed to the newly created position of general promotion manager of the general sales department of Equitable Gas Co., Pittsburgh. He was formerly assistant to the vice president and general manager of the Kentucky West Virginia Gas Co., Ashland, Ky.

In addition, SEXTON M. LINGER, safety supervisor, was appointed technical fieldman "A" and CLARENCE R. TEWKSBURY took over Mr. Linger's duties as supervisor of safety and welfare in the production, transportation, and compressing station departments.

FRED C. HOLBROOK has been appointed sales manager of the M. M. Hedges Manufacturing Co., Chattanooga, Tenn. NEIL HANNAN, assistant general manager, will continue his work in sales and shipments and will be the direct factory contact for Hedges customers.

HOWARD S. BUNN and THOMAS D. CARTLEDGE have been elected vice presidents of Union Carbide & Carbon Corp., New York. Mr. Bunn is president of Bakelite Co., a Union Carbide division, and Mr. Cartledge is president of the Linde Air Products Co. division.

WILLIAM B. TIPPY, vice president of Commonwealth Services Inc., New York, has been elected a member of the board of directors of Peoples Water & Gas Co., Miami Beach, Fla.

CHARLES W. DAVIS is now plant superintendent for Peoples Water. Recently he has served in a similar capacity in Montreal, Canada.

WILLIS C. FITKIN has been elected president and chairman of the board of Michigan Gas Utilities Co. He is also president and board chairman of National Gas & Oil Corp.

The following changes have been announced by Central Illinois Electric & Gas Co., Rockford: D. C. McCLURE from president to chairman of the board; J. E. MURRAY from vice president and treasurer to president; H. E. BRAUNIG from vice president-operations to executive vice president; L. W. ESTEN from director of personnel and customer relations to treasurer. Advertising, publicity, customer survey and related activities will be under the direction of F. L. FLETCHER, sales manager.

ROBERT H. WILLIS has been promoted to vice president and general manager of the Lake Shore Gas Co., Ashtabula, Ohio, and vice president of the Lake Shore Pipe Line Co.

R. L. STEPHENSON, who has been division dealer sales assistance supervisor, has been named dealer assistance coordinator for Lone Star Gas Co., Dallas.

GAVIN H. D. MARTIN is now chief engineer of Union Gas Co. of Canada Ltd., Chatham, Ont. RALPH E. KUSTER has joined the company as corrosion engineer.

GILBERT L. HOLT has been promoted to works manager of the Berwick (Pa.) plant of American Car & Foundry Co. Previously he was production manager.

H. E. JOHNSTON has been promoted to manager of Dearborn Chemical Co.'s New York office. Recently he was manager of No-Ox-Id sales in the eastern division.

Sharples Chemicals Inc., Philadelphia, has appointed HAROLD L. BROWN to the New York regional office, covering Connecticut, Manhattan Island, and portions of New York, Pennsylvania, and New Jersey. NORMAN P. PHILLIPS, in the midwestern regional office, will service Sharples customers in Ohio, Kentucky, and Tennessee from offices in Cleveland.

OSCAR PAYNE, treasurer of Watts, Payne Advertising Inc., has been named executive vice president. His former duties as secretary have been assumed by DON MITCHELL. BENTON FERGUSON has been named vice president in charge of public relations.

ALBERT A. CREE has been re-elected for the 18th consecutive term as a director and president of Central Vermont Public Service Corp., Rutland. New directors elected are HOMER N. CHAPIN, GEORGE W. FULKS, and L. DOUGLAS MEREDITH.

ALBERT G. LINDSAY, former manager of Crosley Corp.'s foreign division, has joined Rockwell Manufacturing Co. as manager of the export and international divisions, with headquarters at the Pittsburgh offices. The company has also named GEORGE A. CUNNINGHAM, former sales engineer in the At-

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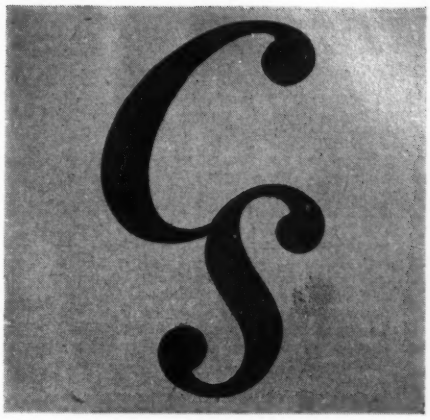

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POSITION WANTED by graduate engineer with 4½ years experience in design, construction and operation of natural gas distribution systems, now holding responsible position, but desires change. Registered Professional Engineer. Box 15, GAS Magazine, 198 S. Alvarado St., Los Angeles 57, Calif.

ASSISTANT GENERAL SUPERINTENDENT. New England Gas Utility desires a man under 40 years of age to fill this newly created position. Engineering graduate required. Please submit complete resume, including personal background, education, experience, and present salary level. All replies treated with strictest confidence. Box 20, GAS Magazine, 198 S. Alvarado St., Los Angeles 57, Calif.

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On employee and public safety in the gas industry available July 1, 1953.

More than twenty years of experience in the industry with proven results. Past Chairman of the Accident Prevention Committee of the American Gas Association, Past Chairman of the Executive Committee, Public Utilities Section, of the National Safety Council, member of the American Society of Safety Engineers and Veterans of Safety and at present Safety Consultant for A.G.A.

Conference desired with gas company officials to work out a plan to reduce accidents and save cost of operation in your company.

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G. R. Cunningham
Rockwell

lanta district, as assistant manager of gas products sales.

Rockwell has also announced the promotion of P. E. W. GOODWIN JR., formerly manager of outside manufacturing facilities, to manager of a new company meter and valve plant scheduled to open next fall in Sulphur Springs, Texas.

C. B. PHILLIPS, vice president in charge of sales for Surface Combustion Corp., Toledo, Ohio, has been re-elected 1st first president of the National Warm Air Heating & Air Conditioning Assn. WILLIAM D. REDRUP was also re-elected president of the association.

P. E. W. Goodwin
Rockwell

H. L. Purdy
B.C. Electric

DR. HARRY L. PURDY has been named a vice president of British Columbia Electric Co. Ltd., Vancouver. In addition to his present duties dealing with cost controls, rates, and research, Dr. Purdy will have the gas division reporting to him.

New faces

WARREN J. MEYER has joined the engineering staff of H. Emerson Thomas & Associates, Westfield, N. J.

R. G. MYERS has joined Davey Compressor Co., Kent, Ohio, as southwestern district manager serving Texas, Oklahoma, Louisiana, Arkansas, and New Mexico.

R. G. Myers
Davey

Roy Snypp
Empire

ROY SNYPP has joined Empire Stove Co., Belleville, Ill., as branch manager for the Detroit territory.

RAYMOND LUBAR and FRANK D. O'SULLIVAN have joined Servel Inc. as district managers in the Washington, D. C. district and Bridgeport, Conn. district, respectively.

Deaths

RAYMOND BEENY, 55, secretary-treasurer and a director of the Alabama Gas Corp., Birmingham, died recently. Mr. Beeny, who joined Alabama Gas in 1940, was at one time associated with a utility in California and with the Southern Natural Gas Co.

CARL P. ZIMMERER, treasurer of Ebasco Services Inc., died late in April. Upon formation of Ebasco in 1935 Mr. Zimmerer became general auditor of the company, rising to treasurer in 1945.

WILLIAM C. ROYAL, 48, Cleveland representative of Selas Corp., died suddenly in April.

How well do girth weld sleeves resist loading and bending stresses?

By G. B. GRABLE and G. M. McCLURE • Battelle Memorial Institute

UNDER the sponsorship of five pipeline companies, Battelle Memorial Institute carried out a series of tests during 1951 to determine the actual performance of sleeve reinforcements for girth welds under operating conditions in the field.

Previously, there was little technical information available on this subject although welding sleeves have been used for some time in the field to reinforce girth welds in pipelines at critical locations where maximum strength is needed.

While sleeves are not normally used over welds known to be seriously defective, they may be considered for reinforcement in cases of uncertainty as to the quality of a girth weld. Configurations similar to welding sleeves are also employed as integral parts of some other types of pipe fittings. In many of these instances, the value of the sleeve reinforcement may be questioned and a number of pertinent questions may be raised. For example:

1. For a straight section of pipe under internal-pressure loading only, how much load does a sleeve take when over a sound, strong girth weld?
2. For similar loading, what is the performance of a sleeve over a girth weld that has developed a crack?
3. What is the performance of a welding sleeve under combined pressure and bending loading?

Each of these questions may also be raised when variable loads occur, so that repetitions of stress could cause fatigue failure of the pipe.

While some answers may be provided by theoretical analysis, the reasoning is not entirely convincing. Theoretical calculations do not take into account some variance in welding effects or sleeve fit that occur under actual field conditions. Tests on full-scale specimens would be expected to provide a more practical evaluation of the sleeve performance under service conditions.

Five sponsors

The tests conducted by Battelle were sponsored by five gas pipeline companies —Columbia Gas System Service Corp., Tennessee Gas Transmission Co., Texas Eastern Transmission Corp., Transcontinental Gas Pipe Line Corp., and United Gas Pipe Line Co.

Eight tests, indicated in *Fig. 1*, were performed to determine the stresses carried by a welding sleeve under the following conditions:

1. Internal pressure alone.
   - A. With no girth weld under the sleeve (simulating a completely failed girth weld) *(Test 1)*.
   - B. With a leaky girth weld under the sleeve *(Test 2)*.
   - C. With a sound girth weld under the sleeve *(Test 3)*.
2. Bending alone with a sound girth weld under the sleeve *(Test 5)*.
3. Pressure plus bending with a sound girth under the sleeve *(Test 7)*.

To serve as a comparison for these tests, a length of pipe made up with a sound girth weld that was not covered by a sleeve was also subjected to internal pressure *(Test 4)*, bending *(Test 6)*, and the combination of pressure and bending *(Test 8)*.

The specimens for all of the tests were fabricated from welded 26-in. diameter 0.281-in. wall pipe with a minimum specified yield strength of 52,000 psi. The welding sleeves used were 26 in. ID, 12 in. long, with a ½-in. wall. They were fabricated from Grade B pipe steel with a minimum specified yield strength of 35,000 psi.

Standard field welding practice was used in fabrication of the test specimens. In welding on the sleeves, the longitudinal welds were made simultaneously, then one circumferential fillet weld was completed before the other was started.

The specimens tested with internal pressure only in *Tests 1* and *2* were approximately 23 ft long including the caps, while those used in subsequent tests were approximately 42 ft long.

In all of these tests, SR-4 bonded wire

G. M. McClure

G. B. Grable

Mr. McClure (left) is research engineer in the applied physics division at Battelle, where he has been since 1949. Most of his time has been spent on engineering problems connected with large-diameter gas pipelines. Mr. Grable is assistant supervisor of the welding research division. He was formerly in the welding research division of the A. O. Smith Corp. and since joining Battelle in 1950, he has been engaged in structural welding research.

strain gauges were used to measure strains in the sleeve and pipe at critical locations. Strain readings were taken at various pressure levels until excessive yield occurred. The data obtained from these gauges afforded information on the loads carried by a sleeve under the various testing conditions.

Increased pressure

In *Tests 1* and *2*, the pressure was gradually increased until the specimen burst, whereas, in *Tests 3* and *4*, the pressure was taken to only 900 psi so that yielding would not occur in the specimen, which was to be used in the succeeding tests. For the same reason, bending loads producing not more than a 2-in. center deflection of the 42-ft length were applied in *Tests 5* and *6*. This total deflection was equivalent to about 0.014 in. per foot of bend in the center section of the specimen.

The procedure used for combined pressure and bending to bring about failure in *Tests 7* and *8* was as follows: first, an internal pressure of 900 psi was applied; second, with this pressure held constant, a bending load that produced a center deflection of 20 in. in 42 ft of length was applied (about 3-in. deflection was enough to cause longitudinal yielding of the pipe wall); and third, with 20-in. deflection, the internal pressure was increased until failure occurred.

The method of applying a bending load to the pipe specimens in *Tests 5, 6, 7,* and *8* is shown in *Fig. 2.* The specimen, shown in the right side in the figure, is connected at both ends to a strong back. Two hydraulic jacks, spaced 5 ft on each side of the center of the specimen, supplied the bending load.

To minimize friction, the pipe specimen was supported every 6 ft by cradles on casters, which rolled on steel plates attached to foundation timbers.

Deflections at the center of the specimen were obtained by observing the movement of the pipe specimen relative to a taut wire stretched from one end of the pipe to the other.

Bursting pressures and bend deflections for the different test conditions are shown in *Fig. 1.* Data from the strain-gauge measurements are not given here for lack of space.

With no girth weld under the sleeve, under conditions of internal pressure only, the specimen in *Test 1* failed at 1565 psi. Failure occurred in the sleeve next to the fillet weld and extended completely around the circumference of the specimen, as shown in *Fig. 3.*

In the case of the leaky girth weld reinforced by a welded sleeve *(Test 2)*, failure occurred at 1600 psi. As shown in *Fig. 4*, the fracture was in the pipe body away from both the sleeve and the longitudinal weld in the pipe.

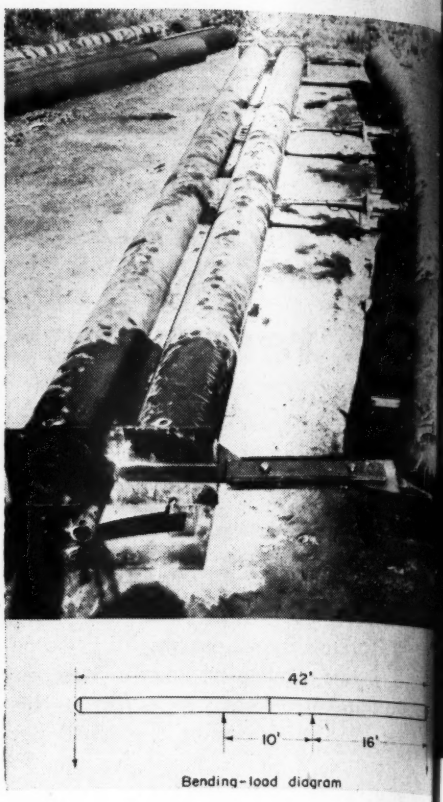

Fig. 2. Method used to apply bending load in Tests 5, 6, 7, and 8. The bending load was supplied by the hydraulic jacks on each side of the center of the specimen.

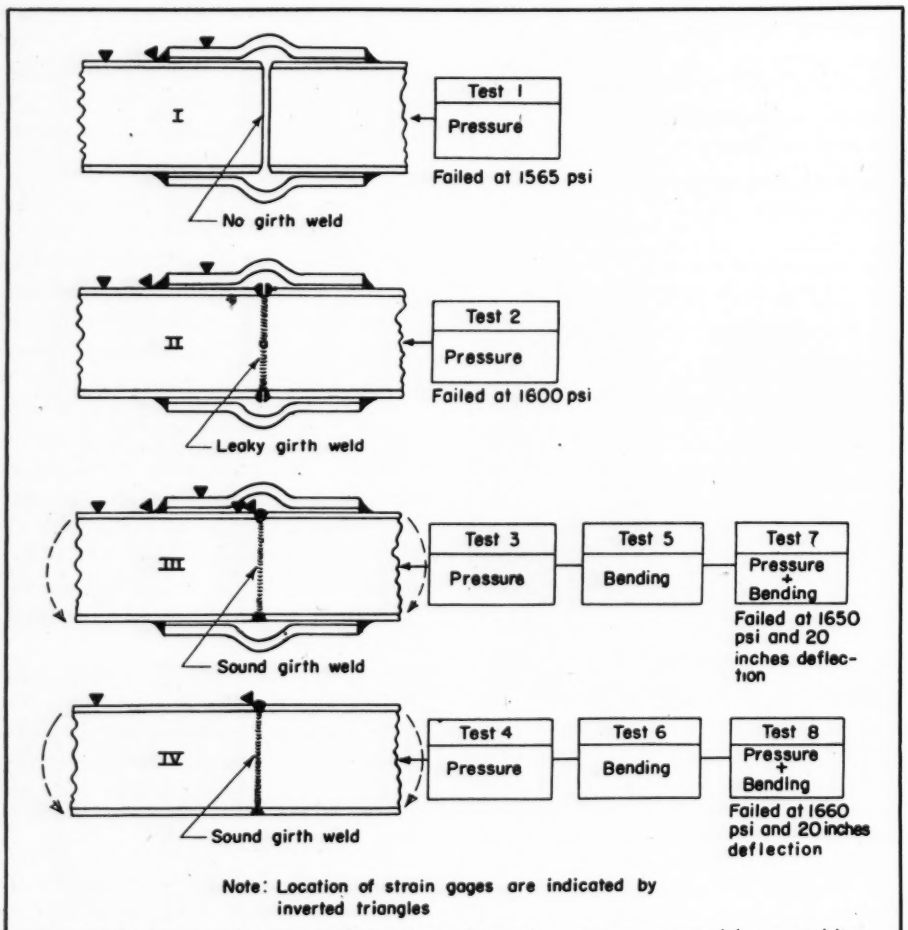

Fig. 1. Summary of tests performed to determine stresses carried by a welding sleeve under varying conditions.

Buckling occurred

In the pressure plus bending tests *(Tests 7* and *8)*, failure occurred by buckling immediately adjacent to the pads under the jacks at the loading points. The bursting pressures, after bending was discontinued, were 1650 and 1660 psi, respectively.

The conditions of stress around a sleeve under the various test loadings, as determined from the strain-gauge measurements, may be summarized as follows:

1. Under internal pressure only:
   A. The sleeve carried the load when it covered a completely cracked girth weld, but had a slightly lower

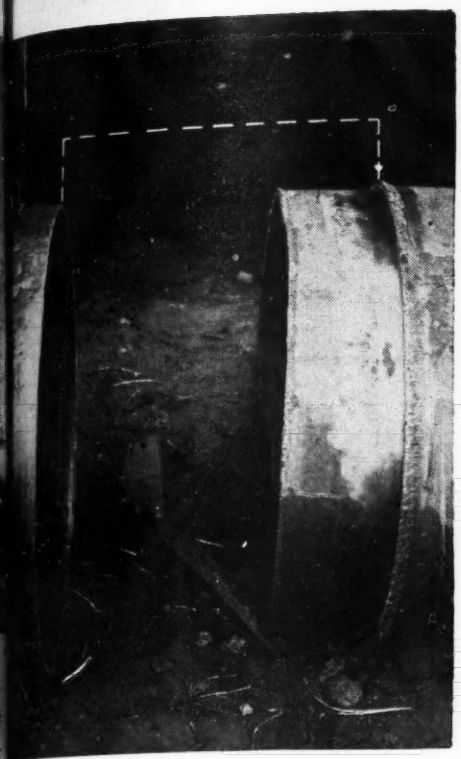

Fig. 3. Failure during Test 1 occurred in the sleeve next to fillet weld and extended completely around the circumference.

Fig. 4. Failure in Test 2 was in the pipe body away from both the sleeve and the longitudinal weld in the pipe.

strength than that of a sound joint with no sleeve.

B. When used over a sound girth weld, the sleeve shared little of the circumferential stress. Also, in this case, the longitudinal stress in the pipe under the sleeve was increased slightly by the presence of the sleeve. This was caused by the tendency of the pipe wall to "balloon out" into the sleeve pump.

C. The stress at one point on the sleeve fillet weld was found to be higher than the stress next to a sound girth weld not covered by a sleeve.

2. Under 900-psi internal pressure plus bending:

A. The circumferential pressure stresses in the sleeve and in the pipe wall under the sleeve on the outside of the bend were changed very little by elastic bending.

B. The exact longitudinal bending stress assumed by the sleeve was, in part, determined by the fit between the sleeve and pipe. On the average, however, with increasing bending, the sleeve assumed part of the bending load, thus preventing a rapid rise of stress in the pipe wall under the sleeve.

C. The observation made in 1 (C) above also applies here for pressure plus bending loads.

In evaluating the foregoing results, it should be pointed out that some of the data obtained in the tests that involved bending within the elastic range can be applied to similar pipe configurations under straight axial loads. In a thin-walled pipe of 26-in. diameter subjected to elastic bending, the stress gradient through the wall is so small that a given section of the wall "does not know" whether the over-all load on the pipe is a bending or an axial force. For example, data obtained in the elastic range from strain gauges on the outside of the bend can be applied to similar pipe configurations subjected to pure axial tension. Similarly, data obtained in the elastic range from the strain gauges on the inside of the bend can be applied to cases of pure axial compression.

Representative pipe

Evaluations of the test results presented here are also based on the assumption that the specimens used were representative of pipe configurations that are found in the field. An attempt was made to make the assembly and welding practices representative. However, the fit of the sleeves and the exact contour of the welds to a large degree determine the level of peak stresses that occur in such assemblies. These factors are not readily controllable and may cause a considerable variation in stresses. It is reasonable to assume that stresses both higher and lower than those obtained here could be found in any group of sleeved joints subjected in the field to similar loads.

General conclusions

The results obtained on the full-scale tests permit the following general conclusions concerning the use of sleeves:

1. A sound welded girth joint is superior to a sleeved joint because the stress concentrations produced by a sleeve might decrease the strength of the pipe under static loads and would be especially detrimental under repeated loads.

2. Wherever feasible, it is considered better practice to replace girth welds that are suspected or known to be defective rather than to sleeve the joint.

3. Where it is not feasible to replace girth welds that are suspected or known to be defective, a sleeve reinforced joint should perform satisfactorily under conditions of static loading where bending stresses are not great.

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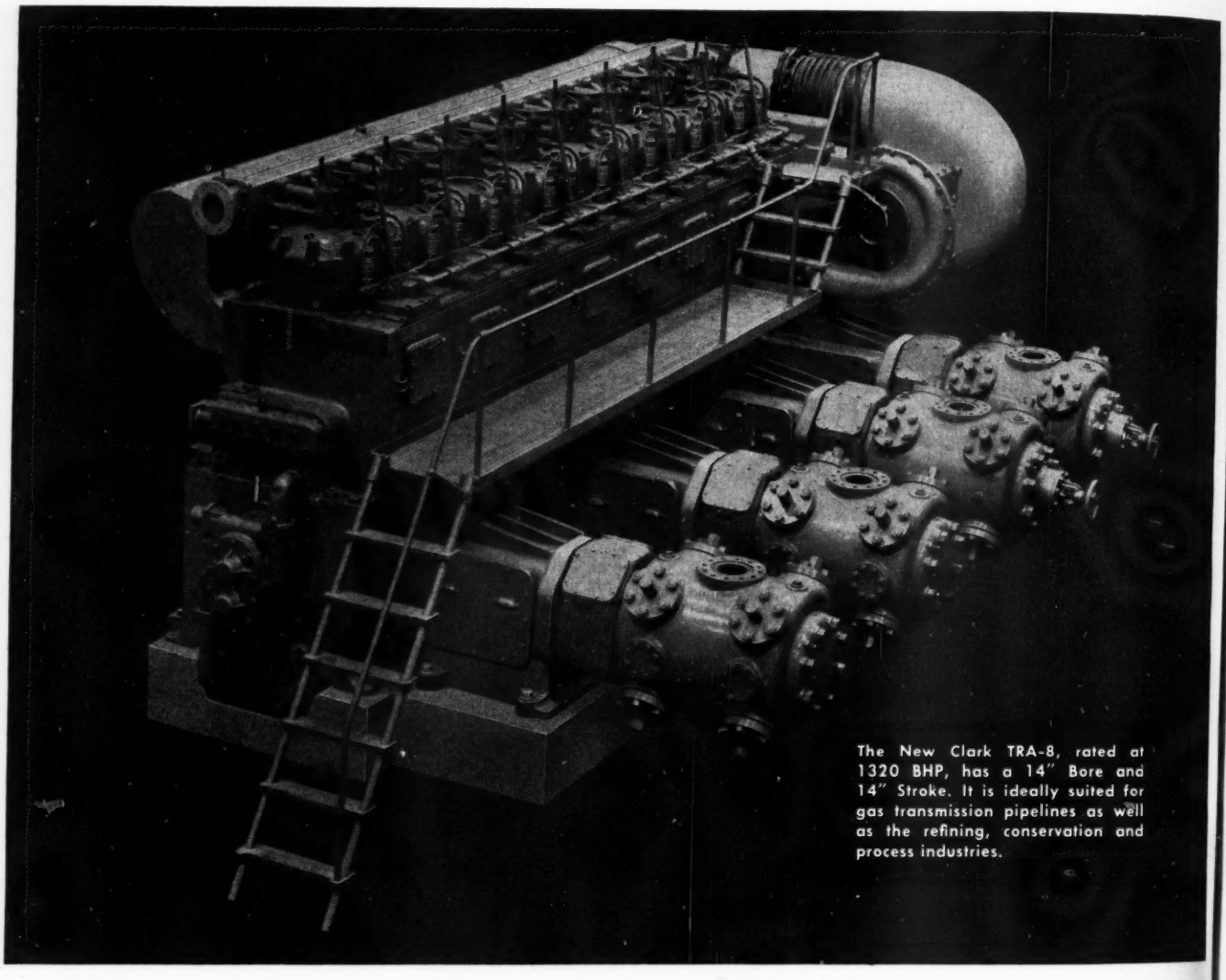

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Subcommittee 8's long-range goal: Reducing accidents to "acceptable levels"

*Efforts toward achieving flexibility and providing for changes, and complications of major technical problems such as "notch sensitivity" related in 1-year progress report on piping code revision by Chairman Fred Hough.**

HOW good is a good safety record? Measured with the yardstick of public opinion, our safety record is not good enough. The leaders of our industry have concluded that its safety problem is one of the most important problems facing it today, as the formation of Subcommittee 8 attests.

The public, of course, does not demand *absolute* safety; its attainment in modern life is an impossibility. Every industry whose operations can jeopardize public safety has the problem of determining the extent to which it is justified in going to eliminate accidents. If a railroad line passes through a small city, there will from time to time be accidents at crossings or at other places along the right-of-way, all of which could be prevented if each right-of-way were fenced with gates placed at each street crossing and guards placed at those gates—or if grade separations were placed at all crossings. But experience has shown that by use of warning signs at little-used crossings, automatic wigwags at more frequently used crossings, and guard gates or grade separations at the most important intersections, accidents can be reduced to an *acceptable* level.

The public will demand increased safety provisions in such cases only when the frequency of accidents leads it to suspect that the railroad is failing to take the precautions it should to protect the public. Similarly, the gas industry's safety record is only good or bad, adequate or inadequate, as the public believes it is. It is by this yardstick that our safety record falls short.

The public does not realize that the relatively large number of pipeline blowouts in recent years in gas distribution systems are the result of unusual situations that are not likely to occur again. It has become alarmed and has to some degree lost confidence in the safety of gas operations, as is evidenced by the frequency with which gas explosions or blowouts are reported in banner headlines in newspapers, and the pressure being put on governmental agencies to enact regulations controlling the design, construction, testing and operating of gas facilities. The insurance industry, too, has suffered losses to the extent that it now writes excess public liability and property damage insurance to only a limited extent.

The long range goal of Subcommittee 8, then, is to produce a code that will be effective in reducing accidents to an *acceptable* level, by making a thorough study of past failures and determining preventive steps to be taken in the future. For the present, however, the situation can be greatly improved by publishing a revised and expanded code based upon conclusions drawn from presently available information.

How explicit?

One of our difficult problems is to decide how extensive and how explicit our code should be. Since the main objective of our work is to produce a code which will be effective in reducing accidents, vague, noncommittal statements which neither give the user of the code useful information nor an inkling as to the committee's thinking, are worthless and have no place in the code. Our effort is being directed to the development of a strong, comprehensive code which will make the greatest possible contribution to safety, without, at the same time, saddling the industry with unnecessarily burdensome and expensive practices.

Some people fear a strong code because they are afraid it will be misused by public officials. It has been my experience that we get into difficulties with public officials concerning code matters primarily in those areas where the codes are vague, ambiguous, obviously inadequate, or silent. On the other hand, where codes are clear and explicit and adequately cover a subject, difficulties and disagreements as to interpretations and applications do not arise. A strong, adequate, clearly worded code, with adequate provision for modifying it to reflect new information and advances in the art, is a great asset to an industry such as ours, and that is the kind of code that we hope to offer to the gas industry.

Lucky to have a code

The gas industry is very fortunate in that at the time the present emergency developed it had a pressure piping code covering transmission and distribution piping. This code has been adopted by reference by all government agencies who have thus far considered it necessary to enact regulations. Without such a code to start with, these state regulations would probably have been much more burdensome than they are. Unfortunately, that code was not designed to meet the conditions currently existing in the industry and does not have broad enough scope to satisfy the public authorities. For this reason each state that has thus far adopted regulations has felt it necessary to superimpose upon the code requirements a large number of requirements of its own. It is my hope and belief that we can develop within the industry a code with sufficient scope and sufficient soundness from the standpoint of public safety to eliminate the need for

*Mr. Hough is vice president, Southern Counties Gas Co. of California, Los Angeles. He delivered his report at the transmission and storage conference, April 30-May 1, in Chicago.

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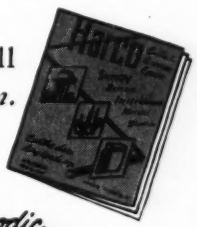

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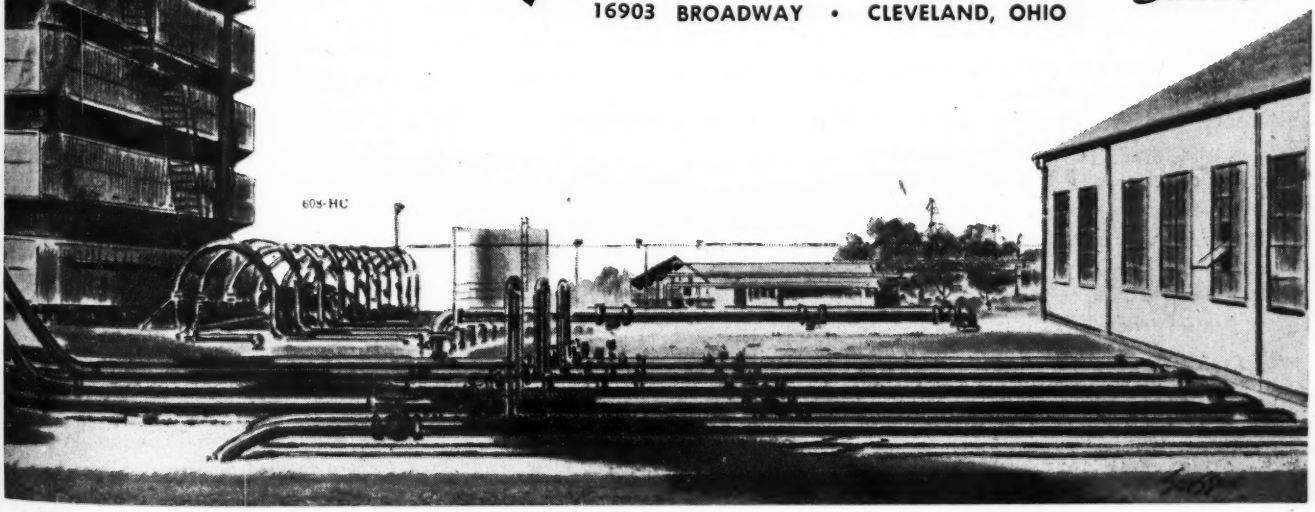


the supplementary regulations that the states are now finding necessary.

In Los Angeles, we've had several experiences that illustrate the advantages of having an explicit code ready when the need arises.

In 1938 there was a holder explosion in Pittsburgh which naturally created concern in the industry and in the minds of public officials all over the country. At that time A. F. Bridge, who was then vice president of the Southern Counties Gas Co., foresaw the great benefit to the industry of having a good holder construction and maintenance code and suggested to the California Public Utilities Commission that such a code be developed for the state of California. The commission acted upon this suggestion and invited the industry to participate in the development of a code. This was done and that code has now been in use in the state for many years.

Valves every 300 feet

In 1947 a tank of potassium perchlorate and sulfuric acid in a plating plant in Los Angeles blew up with a terrific explosion, causing several deaths. As a result, the city enacted a "Dangerous Chemicals Code" in which gas was included and in which the city fire department was empowered to draft and enforce regulations governing transportation and storage of dangerous chemicals. Accordingly, the department began to prepare rules covering gas holders; but when we were able to show department officials that a state code was already in existence, they were convinced that dual jurisdiction with two sets of regulations would be unwise, and accepted the existing code without reservations.

But when the fire department began drafting regulations covering gas distribution systems, a preliminary draft of which required a valve every 300 ft in all gas mains within the city limits, we were unable to produce state regulations that covered precisely the matters in which they were interested, so they insisted on proceeding with the drafting of their own regulations. We were, however, able to get the spacing requirement modified, but it still specifies valves every 1000 ft in some areas.

There's still time

Those companies fortunate enough to be operating in areas where there is no current agitation for such regulations are in the position of still having time to provide an adequate code to forestall governmental action and serve in case some serious accident occurs in their areas—not necessarily in the gas industry—that stirs up public demand for governmental action.

There are, of course, serious problems connected with trying to be explicit in a code. In doing so, we may make it difficult to take advantage of future improvements and to adjust to changed conditions. Also, it is difficult to make an explicit statement covering an industry-wide practice that will fit the varied conditions under which the industry operates in various sections of the country. There are, however, solutions to this problem. One is that an active, small code committee continue to serve after the code is first developed, for the purpose of modifying the code from time to time as the need develops. The chairmanship and membership of this committee should be rotated frequently so that new ideas and different approaches can be injected into the code committee thinking.

We are making extensive use of one device in the proposed code that will make the requirements flexible and easy to change. This will eliminate difficulties in providing specifications covering operating and maintenance problems relating to public safety. By placing these requirements in the code—that each utility shall develop a "program" for its own use, that it shall keep records to show that it is systematically following its own program, and that it shall make provision for adequate follow-up by its own organization to determine that the program is producing results desired and modifying it as experience shows is necessary—we have refrained from spelling out in detail certain operations such as, for example, leakage surveys. It would be highly impractical to attempt to regulate the frequency of such surveys because of widely varying local conditions of soil, types of pipe and joints, age of the system, pressures, size of city served, etc.

Management procedure

In such operations, the code simply prescribes a management procedure that any company giving adequate attention to maintenance is undoubtedly already employing.

The management of a company can readily determine if its organization is complying with the requirements of the code. The tests for compliance are:

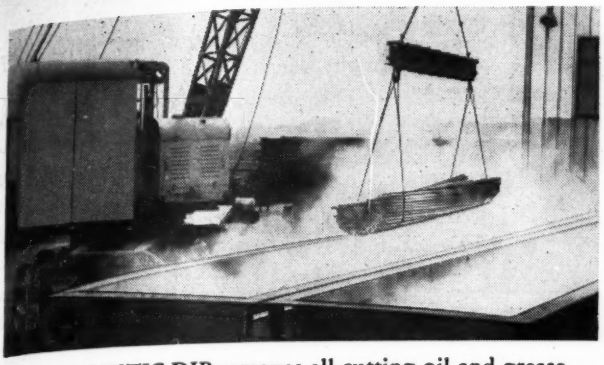
1. Has a plan been prepared?
2. Is it being followed?
3. Is it producing the desired results?

If affirmative answers can be given to all these questions, compliance is complete regardless of the detailed content of the plan. Compliance, in good faith, with such a code requirement cannot help but produce good results in the long run.

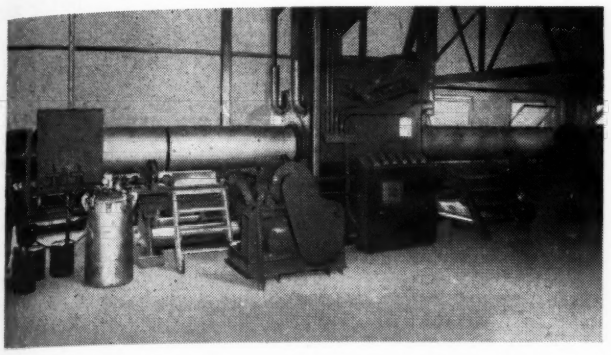
Notch failures

Let us turn now to the consideration of one or two of the major technical problems with which Subcommittee 8 has been struggling. I think without a doubt the most important single fact that has been impressed upon the minds of the committee members, as a result of the committee's studies and investigation, is the paramount importance of scratches, grooves, and cracks as a cause of pipeline failures. Engineers have long recognized the importance of scratches, notches, and cracks as stress raisers. They have pictured their effect as producing a non-uniform distribution of stress within the cross section of a member and thereby producing stresses in some areas that are higher than computed values. It is becoming increasingly evident, however, that such defects in materials lacking sufficient ductility frequently produce failure even though they are so small in relation to the cross sectional area of the member that the stress concentrating effect cannot be important. These failures result from the effect of the scratch, groove, or crack on the ductile behavior of the metal. We are in the habit of considering the steel in our pipelines as being ductile and point with pride to the fact that our high strength pipe specifications provide ductility by prescribing a minimum elongation of about 20% in a 2-in. gauge length in a tension test sample, and we are further reassured by examining laboratory test records on pipe that we purchase and finding that the actual elongation in a 2-in. gauge length usually runs much higher than 20%.

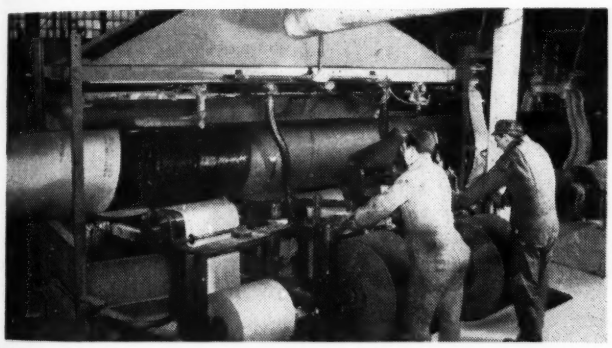
I dare say few of us have stopped to reflect, however, on the fact that when we take a length of pipe, weld heads on the end and test it to destruction by means of hydraulic pressure, the pipe does not swell up like a "poisoned pup" before it bursts, as it would if a 20% elongation were actually realized. Usually no increase in diameter, even in the vicinity of the failure, is readily perceptible by visual examination. Measurements have indicated that in a test of this kind the actual elongation realized before failure occurred does not exceed 5 or 6% even though in a standard ten-



HOT CAUSTIC DIP removes all cutting oil and grease. Pipe is then rinsed in clear, hot water and dried in warming room. Throughout Hill, Hubbell process, pipe is kept at 80-90° to prevent moisture condensation.



ROTO GRIT BLAST removes all mill scale and rust, cleans pipe to bare, bright metal, provides a slight "tooth" to hold coatings in positive bond. Priming coat is applied immediately after Roto Grit Blast.



SECRET of Hill, Hubbell superiority is applying enamel in multiple 1/32" coats instead of one thick coat—pipe protection insurance that pays off in the field. Then pipe is tightly wrapped under even tension by special machines.

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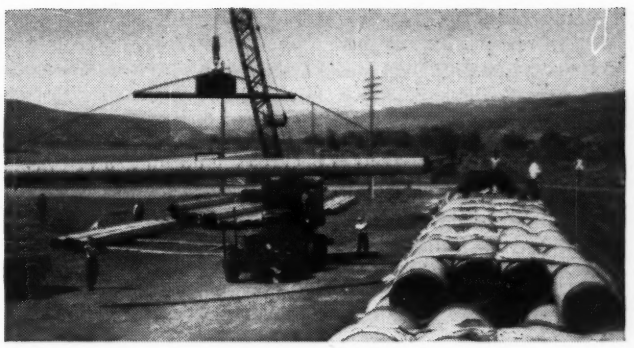

ELECTRONIC holiday detectors inspect every length of pipe before it leaves a Hill, Hubbell plant—further insurance that coatings have dielectric strength to resist electrochemical corrosion underground.

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sion test the steel would elongate 20% or more.

Furthermore, probably without exception, the fracture at failure started at a scratch, notch, or crack. These are very significant facts, which when better understood by our industry will undoubtedly have far-reaching effects on our pipeline design, construction, inspection, and testing procedures.

Some steels are much more notch sensitive than others. Factors affecting the notch sensitivity of steels are many and complex. Suffice it to say here that carbon tends to increase notch sensitivity and manganese to decrease it. Cold working is another factor that tends to increase notch sensitivity. There is another important effect of the chemistry of the steel from the standpoint of its ductile behavior. Cracks in or under weld beads are among the important defects tending to induce brittle behavior, consequently, since high carbon and manganese tend to promote the formation of under-bead cracks, these two elements tend to promote brittle behavior by increasing the chances of cracks being present. Having learned then in this brief lesson that:

1. Pipeline failures almost without exception start at scratches, notches, or cracks;

2. the importance of any given defect of that type depends upon the notch sensitivity of the steel it is in, and that

3. because of the inevitable triaxial loading that always exists in the vicinity of a scratch or notch in a pipeline, the effective ductility of the steel is greatly reduced.

Let us now pick up our slide rule and proceed to design a pipeline. What has happened to the old stick? It seems to have lost some of its luster. It no longer can be considered the infallible tool whereby we can predict the pressure at which a pipeline will blow up or determine the margin of safety between the bursting pressure and any given operating pressure.

Is this line safe?

Furthermore, what has happened to the numbers that we habitually plug into our calculating machine to determine how safe a pipeline is? They don't seem to be as significant as they used to be. How good a measure of safety is 72% of the guaranteed yield strength? Long cross-country pipelines are usually designed for a working stress of 72% of 52,000, which is 37,400 psi. Is a pipeline operating at 37,400 psi safe? The answer to this question depends entirely upon whether or not there are any scratches, notches, or cracks in the pipeline and the sensitivity

of the pipeline steel to those defects.

If in our efforts to get 52,000 minimum yield pipe we have increased the carbon content of the steel to the point where the steel is highly notch sensitive and its ductility has been impaired, and if we have run up the carbon and manganese to the point where under-bead cracking is likely to occur, and if we have cold worked the pipe to the extent that serious impairment of its effective ductility has occurred and its notch sensitivity has increased, then we have a less safe pipeline than we would have if we had used a 48,000 or 50,000 minimum yield strength pipe with high ductility, low notch sensitivity and good weldability—still operating the line, mind you, at the same 37,400 working stress.

Wrong demands

I do not wish to imply our new code is going to propose changes in design procedure of the type suggested here. These matters are still being debated by the committee. It is my personal opinion, however, that the demand that the pipeline industry has put on the pipe manufacturers to raise their guaranteed minimum yield strength has resulted in *losses* in ductility and weldability and in *increased* notch sensitivity that have more than offset increased safety resulting from increased yield strength. It is a slow and difficult process to change procedures that are as thoroughly established as the present pipeline design procedures in our industry. I believe, however, that the industry should work toward changes that will take away the tremendous stimulus that now tends to force pipe manufacturers to make pipe which in laboratory tests is stronger and stronger, but which under actual use conditions is less reliable and less safe.

Therefore, since pipelines do not fail according to slide rule calculations, but according to defects and notch sensitivity too great to tolerate them, it is impossible to calculate the margin of safety that exists between operating pressure and pressure at which a line will fail; and we cannot say with assurance that we have any *definite* margin of safety in any line.

This would be an extremely serious matter were there not a simple and obvious solution—hydrostatic testing of a line after construction but before the line is placed in operation. The line can be tested safely to a pressure sufficient to produce a stress equal to the yield strength of the weakest pipe in the line, a pressure several hundred pounds higher than the designed working pressure of a line designed to operate at a stress equal to 72% of the guaranteed minimum yield. If the safety margin does not actually exist, the line will fail during test without endangering either employees or the public; the weak spot can be replaced, and the line can be finally tested to the desired maximum test pressure.

The likelihood of a line tested in this way failing later under normal operating conditions is extremely small. Testing of this type, while not generally employed now in the industry, has been done on a large scale and with excellent results by some companies and it has been done on a smaller scale by many companies. There is no question that under most circumstances it is a practical way to test and the costs are small compared to the benefits derived, and the costs are not significant in relation to the overall economics of the industry. In fact, I do not believe the industry can afford *not* to use extensively this type of test.

Costs will be minor

None of the things suggested in this paper for improving pipeline safety is going to increase seriously the cost of pipelines. Our committee has made an economic study of the effect on cost of many suggestions for increasing safety. With one exception, none of these taken singly has a significant effect on the cost of gas delivered to market, nor does any reasonable combination of a number of suggested changes have such an effect. The one exception is endeavoring to improve safety by adding wall thickness.

You can rest assured that the improvements that will be suggested by the committee will not produce large or unwarranted cost effects. However, I think the industry must face the fact that some increase in cost is necessary, and must keep in mind that failure to take steps to improve safety will eventually result in government agencies stepping in and imposing design and other procedures on us that might have very much larger cost effects, and yet be ineffective.

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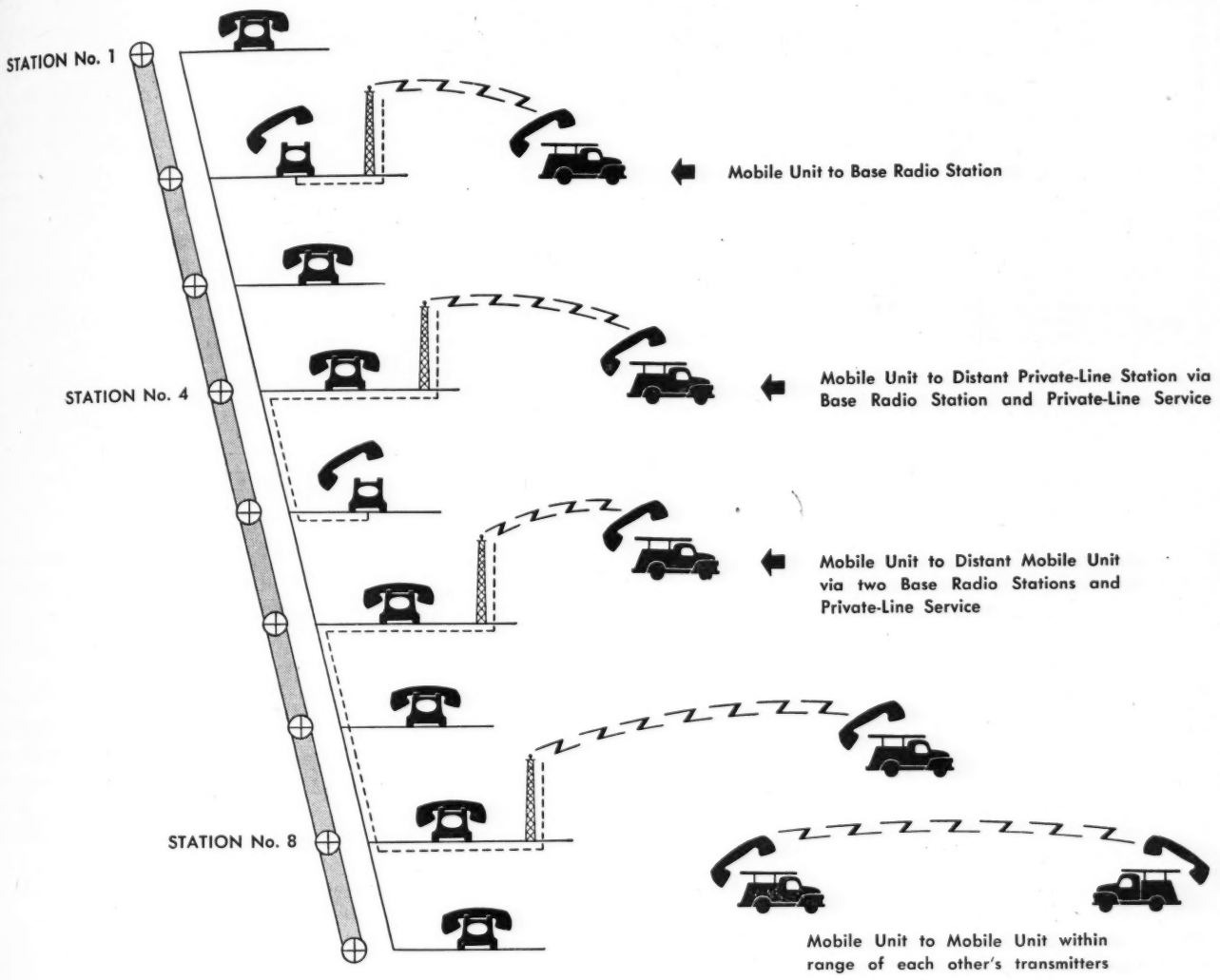
STATION No. 1
STATION No. 4
STATION No. 8
Mobile Unit to Base Radio Station
Mobile Unit to Distant Private-Line Station via Base Radio Station and Private-Line Service
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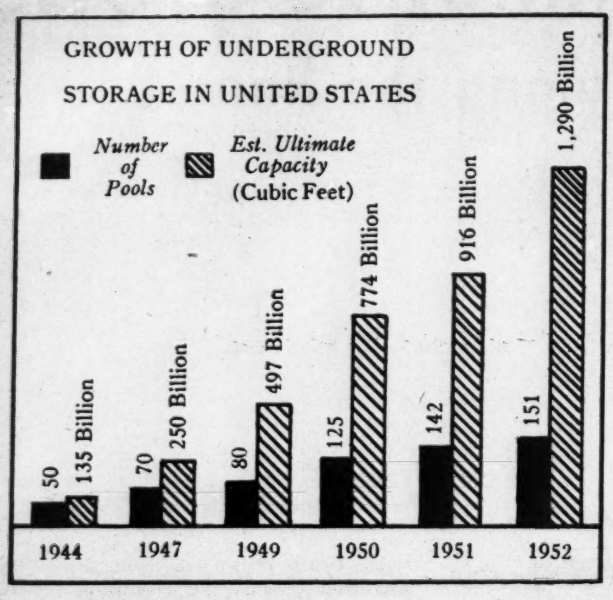

SUMMARY OF DATA ON UNDERGROUND STORAGE, 1950-52

	1950	1951	1952
Number of states	15	15	16
Number of companies	31	32	35
Number of pools	125	142	151
Number of active wells	3,853	4,384	4,940
Number of compressing stations	83	96	97
Total hp of compressing stations	158,173	211,480	248,864
Max. gas in storage—MMcf	412,106	546,720	777,003
In storage Oct. 31—MMcf	—	—	749,487
Input to storage for year ending Oct. 31—MMcf	236,683	337,745	374,120
Output from storage for year ending Oct. 31—MMcf	143,435	200,435	234,792
Max. day output for year ending Oct. 31—MMcf	2,591	3,241	4,101
Ultimate reservoir capacity—MMcf	774,434	915,989	1,292,321
New pools under construction	10	8	17
Estimated ultimate capacity of new pools—MMcf	96,464	136,526	281,498

151 pools now storing 1292 billion feet of gas

THE 17 new underground storage pools under construction in 1952 more than doubled 1951's construction, when eight pools were under way; these new pools will ultimately store an estimated 281,497 MMcf of gas, it was revealed in the second annual report of the subcommittee on statistics of the AGA's committee on underground storage. The report was presented by John B. Corrin Jr., chairman of the committee and superintendent of gas storage for Hope Natural Gas Co., during the transmission and storage conference last month.

By the end of 1952 there were 151 underground storage pools operating in 16 states, compared with an estimated 50 pools in 11 states in 1944, the AGA report disclosed. Ultimate capacity of existing underground natural gas storage pools was increased in 1952 to 41% beyond the previous year. Capacity was expanded from 916 billion cu ft of underground natural gas stored in 1951 to 1290 billion last year. An additional 22% of storage capacity will be available upon completion of the 17 underground pools now under way.

Existing underground storage pools, plus those being built at year's end, will have an ultimate capacity of 1574 billion cu ft of natural gas, the report stated. This compares with a record capacity of 777 billion cu ft, the maximum amount of gas in storage at any time in 1952. However, that capacity is only half the amount ultimately to be stored in those pools.

More than 140 billion cu ft of natural gas was injected into storage than was withdrawn during the year ended Oct. 31; 1952. This situation reflected both the relatively mild 1951-52 winter weather, as well as the need to inject considerable "cushion" gas into newer pools. The maximum daily withdrawal, during the period ended Oct. 31, 1952, was 4.1 billion cu ft, compared with a maximum of 3.2 billion extracted during the preceding year.

UNDERGROUND STORAGE STATISTICS, BY STATE, 1952

(Mcf—14.65 psi at 60° F)

State	No. of Pools	No. of Active Wells	No. of Compressor Stations	Total hp on Compressor Stations	Maximum Gas in Storage (Mcf)	Gas in Storage, 10-31-52 (Mcf)	Input to Storage, Year Ending 10/31 (Mcf)	Output from Storage, Year Ending 10/31 (Mcf)	Maximum Day Output, Year Ending 10/31 (Mcf)	Ultimate Reservoir Capacity (Mcf)	Number of New Pools Under Construction
Arkansas	2	16	1	75	2,250,920	2,116,827	604,813	581,640	7,680	5,060,066	0
California	3	35	3	8,088	15,942,717	15,384,801	15,265,151	15,094,912	318,875	55,782,877	0
Illinois	—	—	—	—	—	—	—	—	—	—	1
Indiana	3	63	2	1,560	1,380,000	1,330,000	1,840,000	245,000	8,000	10,340,000	0
Kansas	12	380	6	9,790	36,309,090	34,726,968	16,155,804	16,305,722	227,484	38,010,947	4
Kentucky	4	202	3	8,520	17,755,325	16,914,494	7,000,773	4,964,431	97,786	24,748,000	0
Michigan	11	747	2	38,680	133,213,675	131,684,081	64,959,055	36,686,070	585,452	223,181,545	0
Montana	1	54	2	2,650	9,722,145	9,722,145	2,764,590	674,003	—	40,016,860	0
New Mexico	4	43	2	2,400	21,544,862	19,864,873	6,590,770	2,768,339	53,659	68,259,498	0
New York	14	267	10	4,700	23,438,315	22,948,001	11,585,725	7,645,780	125,063	29,066,587	0
Ohio	10	1,392	9	34,287	144,586,701	141,598,405	65,439,541	38,458,599	698,896	215,483,699	0
Oklahoma	4	47	2	4,800	51,091,060	50,002,880	22,560,813	10,662,209	152,097	87,970,000	0
Pennsylvania	55	1,281	35	92,049	181,837,208	174,188,099	73,550,046	41,875,658	875,658	300,251,043	3
Texas	2	8	1	600	2,079,962	1,822,417	1,563,907	1,364,372	9,208	6,800,000	3
West Virginia	24	388	17	38,880	129,388,930	121,020,808	79,077,745	56,895,590	921,341	165,477,953	6
Wyoming	2	8	2	1,785	6,462,486	6,162,491	5,160,837	569,943	20,008	21,871,945	0
Total	151	4,940	97	248,864	777,003,396	749,487,290	374,119,570	234,792,261	4,101,207	1,292,321,020	17

How do your equipment costs compare?

T-35 Back Hoe

Owning and operating costs:

Initial investment ----$9580.00*
(complete with GMC 6x6)

AVERAGE COST PER HOUR

A. Fixed owner costs-----$1.22
(Depreciation, interest, insurance, taxes, etc.)

B. Operating costs ------$ .50
(oil, gas, grease)

C. Maintenance and repair costs ----------$ .13
(including tires, cable, etc.)

TOTAL----$1.85

*NOTE: Above figures include average costs for both truck and Bantam, based on mounted hoe unit (20" bucket) with cwts., FOB Waverly, Iowa. (Subject to change.)

Chances are your present budget can be cut in half with T-35 Bantams®!

If you've been handling your pipeline work with *big* expensive equipment (or the usual "spread" of trenchers, high-lifts, dozers, etc.), you're in for a real surprise, when you see the *new* Bantam T-35 Back Hoe in action. Because the T-35 not only lets you handle high-speed trenching, pipe placement and backfilling with ONE machine . . . it does *all* these jobs at the *LOWEST net cost PER HOUR in the industry!* (Based on actual owner records—see average hourly costs above).

Add to these advantages, the T-35's *new remote* control . . . *fast job-to-job mobility* . . . 8 fast-change attachments . . . and you have a cost-saving combination that can't be equalled for handling emergency leak repairs, miscellaneous pipeline trenching, maintenance chores, compressor station work, etc.

See the T-35 Bantam in action *NOW*. Your nearby Bantam Distributor will gladly demonstrate the T-35's versatility on any job you wish, without obligation. A request on your letterhead will start a Bantam your way in a hurry . . . ACT TODAY!

SB-H-22

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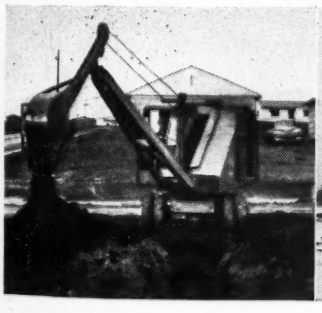
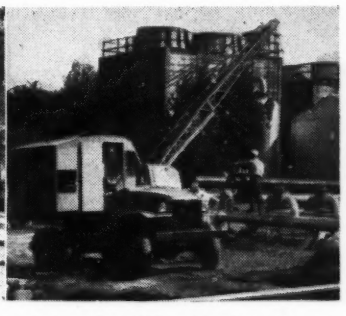


BACK HOE digs over 100′ of 5′ ditch per hr. with full range of bucket sizes. Cuts clean, straight trench to maximum 14′ depth.

CRANE ADAPTOR quickly converts your Back Hoe, for fast unloading and placing of pipe, without changing hoe boom!

BACKFILL BLADE easily attached in 5 to 10 minutes, for fast backfilling. Parallel linkage blade also available for long-run jobs.



6-TON CRANE BOOM (optional 25′ to 50′ lengths) interchanges with hoe boom on the job, where longer reach is needed.

Continuous measurement of water vapor in natural gas achieved with new recorder

By W. M. DEATON • U. S. Bureau of Mines, Amarillo

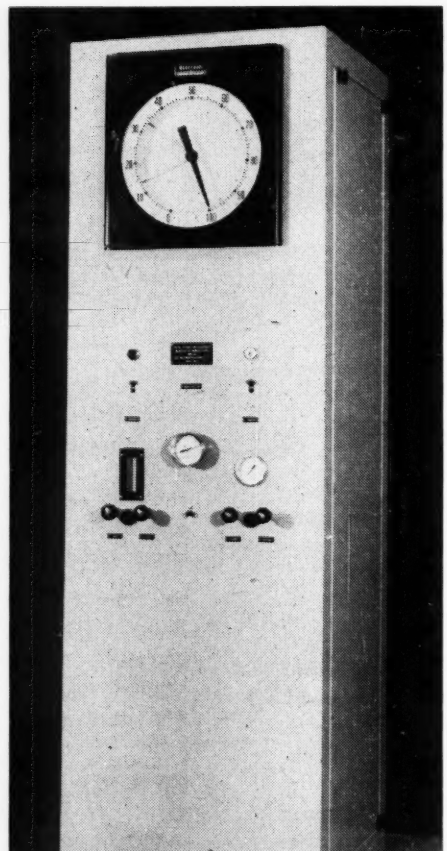
A MEANS of continuously measuring the water-vapor content of natural gas has long been recognized as one of the basic necessities in the natural gas industry; a recording instrument has now been developed, and proved in actual use, which fills this need. It is commercially available, 35 of the instruments having already been placed in operation. Fourteen more are on order by various gas companies.

The recorder was the outgrowth of a cooperative study made by the American Gas Assn. and the Bureau of Mines. This study was inaugurated as the result of a growing realization on the part of the gas industry that water in natural gas pipelines could cause trouble through the formation of gas hydrates. In order to keep gas transmission lines dry and thus prevent hydrate formation, pipeline companies needed a reliable means of determining just how dry the gas was.

Manually operated types

During the course of the investigation, a manually operated dew-point instrument was devised, and it has since become more or less a standard instrument for measuring dew points of gases. But an instrument that would give a continuous record was still desired, so in January 1949 the cooperative project was expanded toward the achieving of this goal. The instrument that grew out of this work is suitable for use with practically all natural gases and at all pressures encountered in present-day operations, and has proved useful at atmospheric pressure and in air streams, and with other gases as well.

At the start of the investigation, a review was made of instruments and methods developed or proposed for the measurement of water vapor in or water dew points of gases. Instruments had been developed for recording the dew-point temperature of gases utilizing mirrored surfaces and photoelectric cells for detecting the appearance of dew as the apparatus was cooled. At least one such instrument had been used in natural gas and was acceptable, so long as the water dew-point temperature of the gas was not lower than the temperature at which hydrocarbons would condense. Because natural gas pipelines operated under relatively high pressures and frequently the natural gasoline dew point was above the water dew point, this instrument was not always suitable, and an instrument of a different type was needed.



Developed by the Bureau of Mines, this instrument for continuously measuring the water-vapor content of natural gas is now on the market and in limited use.

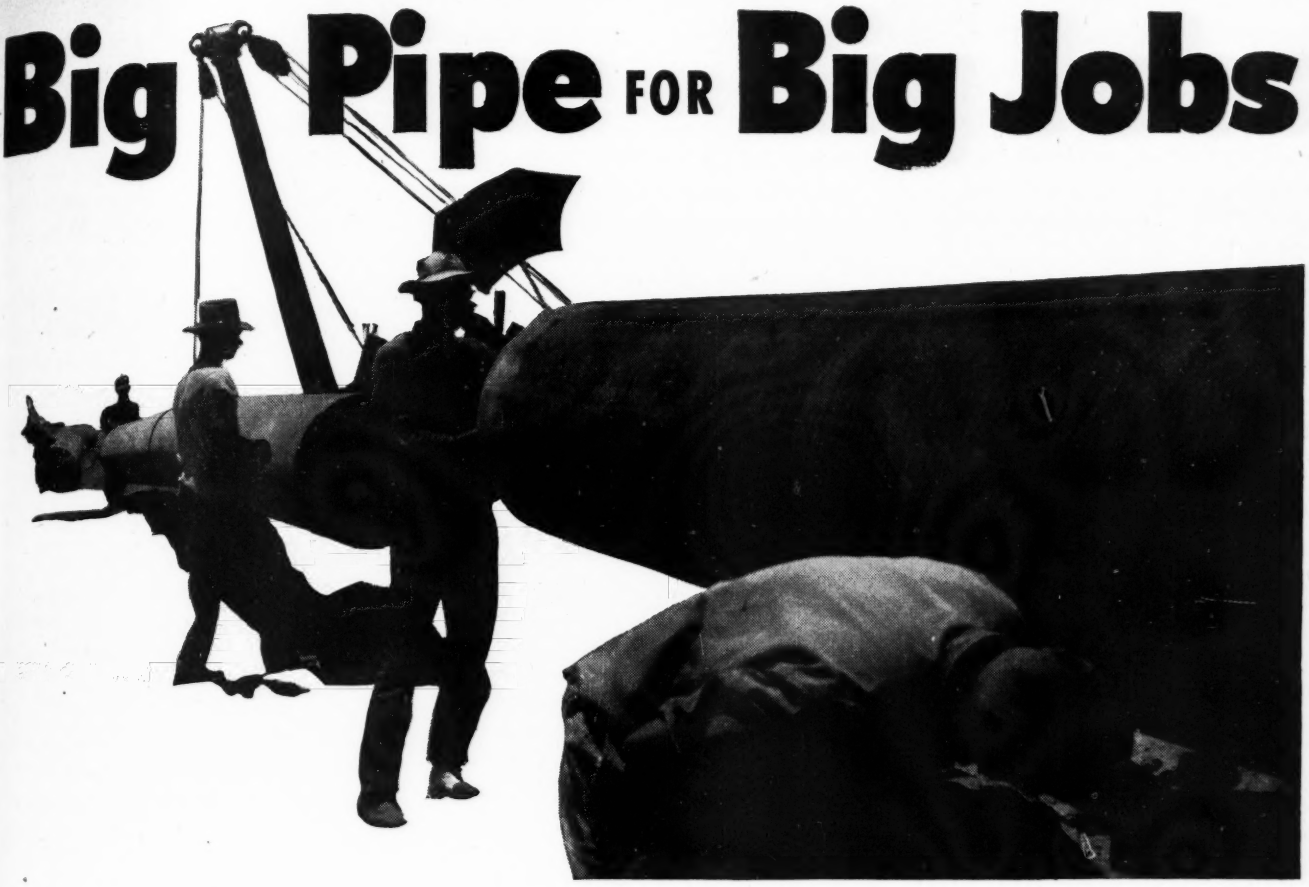
Performance

The instrument developed by the Bureau of Mines during this cooperative study is suitable for recording the water-vapor content of natural gas where the dew point is not lower than about —20° F. The upper limit of water dew-point temperature detection is limited only to that of the ambient temperature. This is a rather wide range of temperature, and the whole range can be attained by only changing the water-element or the operating conditions of the recorder. For any particular sensing element or set of conditions, however, the range of the recorder is limited to a spread of about 20° F. So far as pressure is concerned, the instrument has been operated all the way from atmospheric pressure to 2500 psig, and there is no obvious limit to its use at even higher pressures.

The natural gas industry, after learning of the development of the dew-point recorder, requested that it be made available if possible, even though the full study was not yet complete. In response to this request and a request by a manufacturer for permission to make the instrument, the Department of the Interior granted permission for its manufacture.* The assembled instrument is shown in

*Refinery Supply Co., Tulsa, Okla.

Big Pipe FOR Big Jobs



...El Paso Natural Gas Company's 32-mile loop west of Guadelupe Station

Top: Crew is lining up two 30-foot lengths of 30" diameter, 0.335" wall Republic Electric Fusion Welded Line Pipe that has been double jointed.

Below: A section of the 32-mile loop.

● Republic Electric Fusion Welded Pipe goes together fast. Its circumference always is constant. Its wall thickness always is uniform. Field joints line up quickly and accurately. An even distribution of metal all around the pipe wall permits top-speed welding around the entire circumference.

This high pressure line pipe is electric fusion welded inside and out. Then it is hydraulically expanded to uniform size, straightness and circumference—and to increase its high yield strength for safe handling of high pressures.

At Gadsden, Alabama, Republic's integrated mill is producing mile after mile of expanded Republic Electric Fusion Welded Line Pipe —in sizes 24-inch through 30-inch O.D.—to help bring more natural gas to more users.

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the photo. Its acceptance had been rather rapid—in addition to the 35 in use in the gas industry, four recorders have been put to use on natural gas by the Bureau of Mines in its helium production operations, and an additional 15 are serving special purposes on helium gas streams.

Hygrometer used

At the beginning of the study** instruments and means available for measuring water vapor in gases were investigated. Although the dew-point method is basically satisfactory, the difficulties of using such a method in natural gas streams under pressure had been demonstrated by previous investigators, and it was obvious that condensation of hydrocarbons and accumulations of oil and dust on the dew-point mirror surface would interfere seriously and probably would be difficult to overcome. The electric hygrometer that had previously been developed by F. W. Dunmore of the National Bureau of Standards appeared to offer the greatest possibility of success, and the present instrument is based upon the use of this element. Consultation with Mr. Dunmore revealed that the bureau had no plans or direct interest in developing the electric hygrometer for use in natural gas streams under pressure, so this work was undertaken by the Bureau of Mines under the cooperative arrangement with the American Gas Assn.

The Dunmore electric hygrometer element is small, being approximately 1½ in. long by ¾ in. in diameter. This is a size that is convenient to put into a pressure cell through which gas under test can flow. Two fine platinum or palladium wires (BS. No. 40) are wound in parallel or double-lead winding around a ⅜-in. plastic tube. The terminals of one end of the wires are imbedded into the plastic tube for anchoring. The other ends of the wires are attached to metal prongs on the base of the element, enabling it to be plugged into a standard miniature radio tube-base socket. The ⅜-in. plastic tube is coated with a water-sensitive plastic film applied by dipping the tube with the windings on it into a water-polyvinyl alcohol solution containing a small percentage of lithium chloride. When dried, the polyvinyl alcohol serves as a binder for the lithium chloride. The water-sensitive film is only a few mills thick, and after being properly conditioned and aged, reaches a condition of constancy of calibration and responds very quickly to changes in the water-vapor content of the gas surrounding the element. In operation, a small alternating current (maximum, 100 microamperes) passes through the lithium chloride impregnated film on the element, and this current varies with the amount of water absorbed in the film, which, in turn, varies with the amount of water vapor in the surrounding atmosphere. The electrical measurement is essentially one of conductance, and this is translated by suitable electrical means into a recorder reading.

Sensitive to temperature

As the electric hygrometer is sensitive to the amount of water vapor in the surrounding atmosphere, it is not necessary to cool the gas being tested to a point where condensation of water occurs. The element is sensitive to temperature changes as well as water-vapor content changes, however; therefore, it is necessary to maintain the element and pressure cell at a selected constant temperature. It frequently is satisfactory to maintain the element at a temperature above ambient, and, in such cases, it is necessary only to provide a thermostating arrangement, whereby small electric heaters can intermittently supply the necessary heat to maintain the unit at the selected above-ambient temperature. Where it is necessary to maintain the hygrometer at a temperature below ambient temperature, a means for cooling the system is provided, and the heaters and the thermostating arrangement are used to maintain the temperature at the selected below-ambient temperature.

Hygrometer elements coated with different concentrations of lithium chloride are used to cover different ranges of water-vapor content or dew points. Usually, any particular element will cover a range of water-vapor content corresponding to a dew-point change of about 20° F. Also, an element of a given dew-point range can, because it is temperature sensitive, be made to cover a different dew-point range by changing the temperature at which it is thermostated. This fact makes it possible to use a single type of element to cover a fairly wide range of dew points, although it is necessary to vary the thermostated temperature to cover the full range. Usually, 20° F is a satisfactory range for any particular installation; therefore, when once the conditions are known, it is not necessary to change the thermostated temperature.

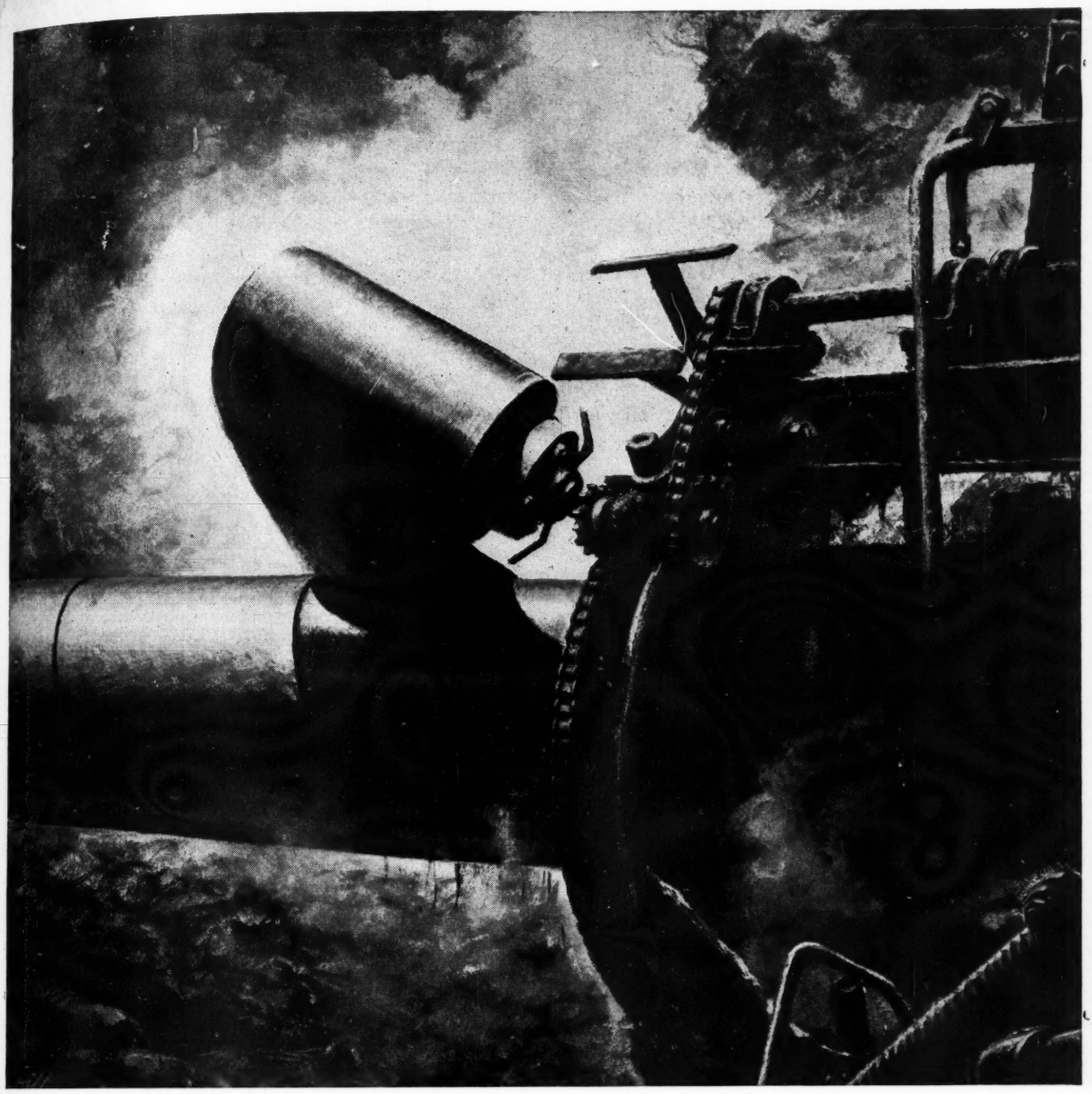
The electrical system used to record the water-vapor content or dew point of the gas under test employs alternating current throughout. It is necessary to use alternating current through the hygrometer element to avoid polarization, and by using alternating current for the potentiometer circuit of the balancing electrical bridge also, it is possible to eliminate almost entirely effects of fluctuations in line voltage that exist in the electrical power source. This matter required considerable investigation before it was finally solved.

The electrical hygrometer unit is not particularly sensitive to anything in the gas stream except water vapor. It is sensitive to vapors that would attack the plastic base upon which the electrode wires are wound. With the present elements, this would probably be aromatic hydrocarbons, and since the binder used to hold the lithium chloride in place is polyvinyl alcohol, the vapors of methyl, ethyl, and other alcohols would likely affect the element adversely. Hydrocarbon vapors other than aromatics, however, have not been found to adversely affect the element. As a matter of fact, it is possible to wash the element in gasoline that has been thoroughly dried by use of silica gel, alumina, or other effective drying agents. An oil film on the element slows down its response to changes in water vapor, but does not keep it from functioning. Provision is made in the construction of the recorder to trap out any liquids that might be carried over in the gas stream, and a micrometallic filter is used to stop any dust carried by the sample gas.

Vapors filtered out

It has been found that small percentages of carbon dioxide or hydrogen sulfide do not affect the hygrometer element, although no tests have been made where these gases are present to a considerable extent. The presence of glycol vapors or amine vapors, however, has been found to affect the element adversely. Means have been provided to filter out any glycol vapors that might be present in the gas by using a very small adsorbent filter consisting of activated alumina or silica gel. Such means have not been found adequate to eliminate amine vapors, but successful operation has been obtained by placing a small scrubber charged with oleic acid in the

**A more detailed report is being prepared for future publication.



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sample stream ahead of the hygrometer cell. These scrubbing devices delay slightly, but not too greatly, the response of the recorder to changes in water-vapor content.

The hygrometer element is only slightly affected by pressure. The effect is large enough, however, to recommend that the recorder be calibrated under the pressure conditions of use. The most satisfactory means of calibrating the recorder is to use the Bureau of Mines' type dew-point tester. This is readily accomplished by inserting a small adsorber in the sample stream to remove water, then adding variable controlled amounts of water vapor to cover the range of the recorder. This may be done by passing a small portion of the dried gas through a side-stream water saturator and rejoining it with the main stream ahead of the hygrometer cell. Then, by connecting the dew-point instrument to the outlet of the hygrometer cell and maintaining the same pressure in both the hygrometer cell and the dew-point instrument and controlling the flow at the outlet of the dew-point instrument, the dew point of gas at the pressure under test for each condition of water-vapor content can be determined directly by means of the dew-point instrument. In case of interference due to condensation of hydrocarbons, it is recommended that the sample gas stream be passed through coconut charcoal to remove the gasoline just prior to the removal of water vapor during the calibration tests. This permits satisfactory dew-point determinations to be made without interference from hydrocarbon condensation even at the lower dew points.

Calibration

As a hygrometer element responds primarily to the partial pressure of water vapor in the atmosphere surrounding it, and this is related directly to the temperature of water saturation (the dew-point temperature), the instrument can be calibrated most readily in water dew point. By referring to water-vapor content curves for the natural gas under test, the quantity of water vapor in the gas per unit volume of gas can be determined. If it is desirable to have the recorder register water-vapor content directly—for instance, in pounds of water per MMscf—then a pressure regulator set slightly lower than the minimum pressure of the gas stream can be placed in the sample line just ahead of the instrument to maintain a constant pressure in the hygrometer cell. In this case, the dew-point calibration can be converted directly into water-vapor content by substituting the corresponding water-vapor contents read from a constant pressure line representing the chosen pressure.

Sampling lines

During the investigation, it became quite evident that the sampling lines to the recorder needed to be given attention. The line should be small enough to be flushed out in a suitably short time to reflect the conditions of gas passing the sampling point in the natural gas pipeline. If the sample line is not short, an extra purge-flow should be taken from the line near the instrument to cut down on the time lag. For the same reason, the sampling line should be small in diameter. Usually, a ¼-in. tubing line is very satisfactory. The line should be clean, as, otherwise, water will be sorbed and desorbed by the scale and dirt in the line and give slow response to changes in the water-vapor content of the gas passing the sampling point in the natural gas pipeline. Further, when the sampling line contains absorbing material, changes in temperature will give false readings due to sorption or desorption of water vapor with changes in temperature of the sampling line. It is recommended that new, clean tubing, either copper or aluminum, be used for the sampling line. The sampling line temperature should never go below the dew point of the gas in the gas transmission line, for if it does, water condensation will occur in the sampling line, and the recorder reading will be correspondingly affected. This would dictate that the line either be buried underground where its temperature will not be lower than the dew-point temperature of the gas flowing in the gas pipeline or that provisions be made to heat the sample line between the sampling point and the recorder.

After installation, the recorder, which is rugged, requires very little attention. At one installation, where the recorder is located in a small unheated "doghouse" typical of orifice meter houses and is subject to changes in the weather, it has been operating satisfactorily for three years or more. Even under severe weather conditions, with temperatures ranging from below 0° F in the wintertime to more than 100° F in the summertime, the recorder has never failed to give a good record.

Although usually the hygrometer cell can be kept at a temperature above ambient for ranges of dew-point temperature between 10° F to 30° F and higher, if a lower range of dew-point temperature is desired, some cooling of the hygrometer cell block is necessary. Frequently, this can be accomplished merely by expanding some of the high pressure gas through the cooling coil attached to the outside of the block. Where unusually low dew-point temperatures are to be covered by the recorder, the cooling principle of the "vortex tube" can be used. In all the Bureau of Mines' installations of the instrument, a vortex tube cooling arrangement is used. With 400 or 500 psi gas, it is quite easy to effect a cooling of 30-40° F below ambient temperature. This is one of the first applications for utilizing the refrigeration from a vortex tube. Although its thermodynamic efficiency can properly be questioned, its simplicity of construction and freedom from operating troubles recommend it for use in this instance.

Although it would be very difficult and extremely expensive to make the entire recorder explosion-proof, the bureau has incorporated in its recorders explosion-proof equipment at the points where any dangerous arcing of electric current is likely.

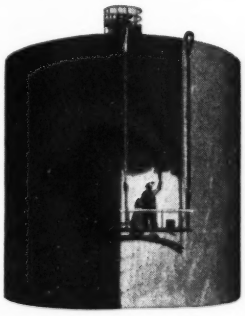
Automatic control

One of the uses to which the recorder may be put is to automatically control the water dew-point of gas being sent out from a plant. At one natural gas plant this is done by incorporating control equipment in the dew-point recorder that will permit some of the gas to bypass the dehydrating plant, thus controlling the dew point of the outgoing gas. The bypass valve closes more and more as the dew point of the gas coming out of the dryer increases, until, finally, the bypass valve is completely closed, and the drying tower is taken off the line.

In keeping with original plans and arrangements with the AGA, a patent application was made by the inventor, and U. S. Patent No. 2,629,253 has been issued. In keeping with government practice, the patent is assigned to the United States of America, as represented by the Secretary of the Interior, in whose hands the licensing of manufacture of the instrument lies.

This article is adapted from a talk presented at the transmission and storage conference in Chicago, April 30-May 1.

"Who said people don't like Black?"



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Pipeline People

JOHN W. BRAND was recently appointed sales engineer for the M. J. Crose Manufacturing Co. Before joining Crose he was with Midwestern Engine & Equipment Co.

John W. Brand
Crose

J. W. Elizardi
Fluor

The Fluor Corp. of Los Angeles has appointed J. W. ELIZARDI as vice president in charge of mid-continent area sales with headquarters in Houston. He has been Gulf coast manager for the Marley Co.

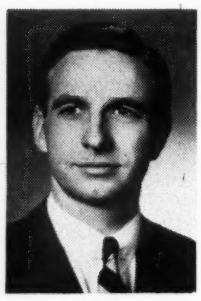
Among personnel changes in Panhandle Eastern Pipe Line Co., Kansas City, Mo. is the recent election of M. K. HAGER to a vice president. He has been assistant to the president for nearly five years. Recent changes in the compressor department include promotion of W. W. OSBORN from assistant plant superintendent at Haven to plant superintendent at Greensburg; V. W. LONG from plant superintendent at Greensburg to the same capacity at Centralia; and M. M. MCELVAIN from plant superintendent at Centralia to the same position at Glenarm.

The Chemical Fire & Rust Proofing Corp., New York, has announced the appointment of EUGENE R. LOPEZ as vice president in charge of sales of protective pipeline coatings. He was formerly with the Barrett Div. of Allied Chemical & Dye Corp.

T. D. Williamson Inc., Tulsa, has appointed TOD PAZDRAL as exclusive sales and service representative for south and east Texas and Louisiana. Mr. Pazdral is president of the Pazdral & Whitaker Construction Co. with offices in Houston. He will be assisted by JAMES H. MCBRIEN, who has had 18 months field experience with Williamson products.

The El Paso (Texas) Natural Gas Co. has announced the following promotions in management: C. L. PERKINS has been elected vice president and general manager to succeed CHARLES C. CRAGIN, who has resigned. H. F. STEEN has been elected to succeed Mr. Perkins as vice president and general superintendent.

ELDON V. HUNT has joined Ebasco Services Inc., New York, as an engineer. He resigned as district superintendent for Transcontinental Gas Pipeline Corp. to accept the position.



A. Miller

E. O. Stoothoff
Texas Gas

ALLERTON MILLER has been named vice president of Texas Gas Transmission Corp., Owensboro, Ky. Succeeding him as secretary is EVERETT O. STOOTHOFF, who for the past year has been assistant to the secretary.

New vice president in charge of planning for Philco Corp. is HERBERT J. ALLEMANG, formerly a management consultant and corporate officer of the company.

Midwestern Engine & Equipment Co. Inc., Tulsa, has announced two new appointments. NORRIS E. COTT, formerly Mississippi valley sales representative for Keystone Asphalt Products Co., was named purchasing agent-sales coordinator and W. F. WINKLER, formerly with the Oliver Corp., is new equipment sales manager.

Tod Pazral
T. D. Williamson

Tom P. Walker
Transco

C. A. Williams

Dr. Gardescu
Ex-Transcontinental

A. G. Van Campen

W. H. Barnes
Clark Bros.

With the opening of a new Kansas City, Mo. district office, Clark Bros. Co., Olean, N. Y. has announced the appointment of A. G. VAN CAMPEN as district manager. To fill the position vacated by Mr. Van Campen, WILLIAM H. BARNES has been appointed district manager at Tulsa.

CARL L. RITTER, Houston, has been promoted from assistant director to director of Continental Oil Co., natural gasoline and gas division.

W. P. CARVER, a veteran of 14 years with General Petroleum Corp., Los Angeles, has been appointed assistant manager of the company's land department.

WILLIAM D. BUCHANAN of Sequoit, N. Y. has been appointed superintendent of the newly created eastern district of New York State Natural Gas Co., Pittsburgh. He has been assistant superintendent of the northern district which was divided.

W. D. Buchanan
N. Y. State Natural

E. L. Colvin
Texas Eastern

Texas Eastern Transmission Corp. has announced the appointment of EMMETT L. COLVIN as assistant division manager in Shreveport. He replaces ROBERT S. COOPER, who has been transferred to Dallas as superintendent of pipelines and compressor stations for Wilcox Trend Gathering System Inc., a Texas Eastern affiliate.

Following the annual stockholders meeting late in April, at which he was elected a director, the board of directors elected TOM P. WALKER president of Transcontinental Gas Pipe Line Corp., Houston. Mr. Walker was vice president of Irving Trust Co., New York. The action followed the resignation of CLAUDE A. WILLIAMS earlier in the month. DR. I. I. GARDESCU, Transco vice president, also submitted his resignation; his successor has not been announced.

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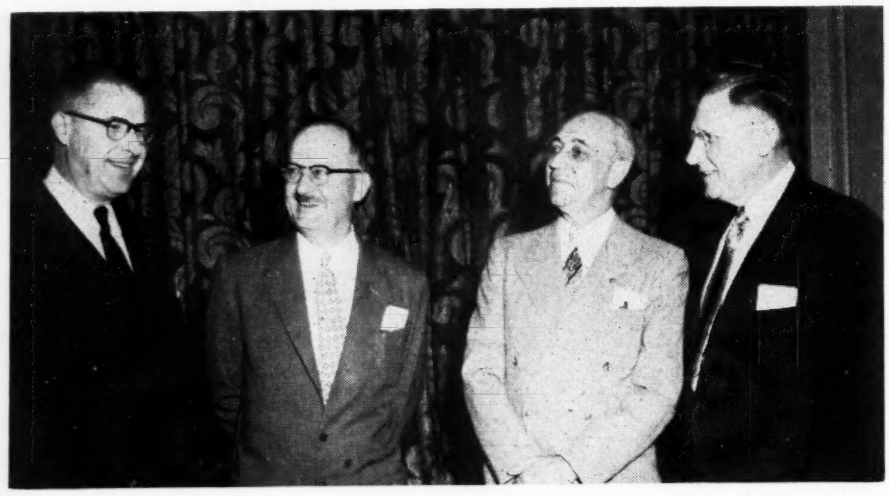


Speakers at the opening session of the AGA transmission and storage conference included Walter H. Davidson, Transco, conference chairman; F. A. Hough, Southern Counties; W. E. Ferguson, Ohio Fuel; and William M. Deaton, U. S. Bureau of Mines.

Frank C. Smith, president of AGA and Houston Natural Gas Corp., accepted for the AGA one of the first conservation service awards ever presented by the Bureau of Mines to an organization outside the U. S. Department of the Interior.

Other speakers heard by the 423 delegates attending the conference at the Edgewater Beach hotel, Chicago, were John B. Corrin Jr., Hope Natural Gas; E. E. Stovall, Lone Star Gas; and Joe T. Innis, Northern Natural Gas.

Pipeline News

Pipeline companies will be full partners in AGA

That the nation's natural gas pipeline companies have moved in force into the American Gas Assn., and will be participating as full partners, was evidenced last month in Chicago as the first AGA transmission and storage conference drew to a close.

AGA's president, Frank Smith of Houston, explained the companies' position to the 423 delegates as the first order of business. Tracing the steps in last year's reorganization of the association in which the natural and manufactured gas departments were merged, Mr. Smith told how the operating section's stature had been broadened to include "authority to consider and deal with all matters relating to producing, gathering, manufacturing, storing, transmitting, and distributing gas and by-products . . .

"For many years, the section has had two officers, a chairman and a vice chairman, both invariably from distributing companies. To give the transmission companies an equal voice in policy planning, a second vice chairmanship was created . . ." (The first incumbent, Walter Davidson, Transcontinental Gas Pipe Line Corp., presided at the meeting.)

Mr. Smith also explained that 22 members representing pipeline companies had been added to the section's managing committee, and three pipeline company members to the executive committee, to balance the membership from distribution companies.

Several committees, some of which are new, others of which had been in the old natural gas department but which are now "reactivated and expanded," have been established within the section—the transmission committee, with subcommittees on pipelines and compressor stations; a load dispatching committee; a committee on underground storage with five subcommittees on statistics, verifying inventory, deliverability problems, storage in water sands, and storage lease forms; a natural gas production committee; and a large volume measurement committee.

The inaugural meetings of the new committees were held at Chicago's mammoth Conrad Hilton hotel, scene of the conference, April 29, the day before the conference began.

Mr. Smith also revealed that reorganizational meetings of the chemical, corrosion and motor vehicle committees were being held to broaden the scope and bring in activities of transmission companies.

The seeming paradox of discontinuing the natural gas department at the moment when natural gas operations had reached the highest level in history was explained

the basis that the job of providing services for such a large segment of the industry was too big for one department, with its small staff, and that greater service could be rendered by the larger staff now available.

The conference etched a broad picture of matters of current interest to pipeline operating men. There was the introduction of "Instruments for Measurement of Water Vapor in Natural Gas," by William M. Deaton of the Bureau of Mines, a progress report on the work of Subcommittee 8 on revising the code for pressure piping by its chairman, Fred A. Hough of Southern Counties Gas Co., Los Angeles; an exploration of a particularly distressing problem, "Cause of Brittle Fracture in Steel," by Professor Earl Parker of the University of California.

There was a new listing of work being done under the AGA pipeline research program, by Joe T. Innis, Northern Natural; a report of tests on large diameter orifice tubes, by E. E. Stovall of Lone Star, Dallas; a discussion of "Selection and Training of Engineering Personnel," by M. S. Viteles of Philadelphia Electric. A new underground storage statistical recap was given by J. B. Corrin Jr., of Hope Natural, and F. M. Banks of Southern California closed the general sessions with a study in public relations titled, "A Pipeliner Meets the Public."

In the pattern of the annual distribution conferences, this meeting split up into parallel luncheon sessions, beginning at 12:30 and continuing through the afternoon. Meetings included those on the work of revising the pressure piping code, compressor stations, corrosion, gas processing, dispatching and communications, gas measurement, pipeline construction and maintenance, and underground storage.

Explore new Waverly Dome for possible gas storage

A possible new underground natural gas storage field has been discovered at Waverly, Ill. The Central Illinois Light Co. and its supplier, Panhandle Eastern Pipe Line Co., are jointly investigating the dome which occurs in a layer of St. Peter sandstone at about 2000 ft. Exploration is continuing to determine whether the sandstone is porous enough to accept the gas and permeable enough so the gas will flow through it.

The gas, under about 900 lbs pressure, will displace the water in the sand and form a large bubble in the top of a dome similar to Natural Gas Storage Co. of Illinois' famous Herscher dome. Geologists estimate the field will hold 100 to 200 billion cu ft of gas.

The "Waverly Dome" was discovered when an oil prospecting group drilled several wells in the area which indicated there was some gas present but no oil. The gas proved to be of insufficient volume for com-

Herscher's financing problem: who would own the stored gas?

Complications other than those encountered in the physical work of developing Herscher dome into a usable underground storage field have had to be ironed out in the course of the field's development, John J. Hedrick, president of Natural Gas Storage Co. of Illinois, told delegates to the recent Mid-West Gas Assn. in Colorado Springs.

Financing was one of the unexpected involvements, necessitating a modification of the FPC certificate for the project. Storage Co., a subsidiary of Peoples Gas Light & Coke Co., Chicago, and affiliate of Texas-Illinois and Natural Gas Pipeline Co., will take gas from the two pipeline systems for delivery to Peoples and other distributing customers in the region.

Who would own the gas?

One question was: Who would own the gas in storage? Mr. Hedrick explained the situation and its solution this way:

"The total delivery capacity of both pipeline systems, except the insignificant quantity which Natural sells directly to mainline customers, is allocated among the utility customers of both pipeline companies. Therefore, the only gas available for both cushion gas and for storage is that quantity of gas which the customers are entitled to but which they may voluntarily make available for the storage operation. In the development of the project, this fact was recognized by the utility customers, and they cooperated fully by advising Storage Co. of the volumes they would relinquish for sale by Natural and Texas-Illinois as cushion gas, and the quantities they desired to have placed in storage from time to time in the future.

"Initially it was intended that as the gas became available for the storage project through relinquishment by the utility customers, the quantities periodically required for cushion gas would be sold by the pipeline companies to Storage Co. for that purpose, and the quantities to be placed in storage as usable gas, later to be recovered, would be delivered by the pipeline companies to Storage Co., with the title to the stored gas remaining in the pipeline companies until delivery to the utility customer.

Financing hit a snag

"When Storage Co. undertook to finance a part of the cost of the project through the sale of bonds to certain institutional investors, those investors insisted that the payment of the indebtedness be assured by the two pipeline companies or by the utility customers who were to benefit by the storage operation. The pipeline companies were advised that their bond indentures do not permit them to become a party to such an arrangement, so a method of operation had to be devised whereby payments by the utility customers for the storage service would afford additional security to the bond purchasers.

"Again the utility customers of the pipeline companies cooperated and the financing of the initial cost of the project has been assured. However, this new arrangement necessitated a change in the plan of operation of the storage project so that the utility customers instead of the pipeline companies own the usable gas in storage, other than cushion gas which will be owned as a plant facility by the storage company. This in turn required an application to the Federal Power Commission for a modification of the certificate authorizing the construction and operation of the storage facilities, and applications by certain of the utility customers to state commissions for approval to enter into such an arrangement. It also has required a complete revision of the form of tariff which had been submitted by Storage Co. to FPC.

Certificates authorized

"In addition to these proceedings, the pipeline companies applied to the Federal Power Commission for certificates authorizing them to make sales and deliveries of gas which will take into account the operation of the storage field. This authorization has now been granted."

Mr. Hedrick also mentioned briefly the difficulties encountered in efforts to secure passage of the Senate's bill S525, which would permit condemnation of lands for storage. (The bill has still failed to win Congressional acceptance.)

Opposition from within industry

"The opposition to the previous bill (introduced in 1951) came from the oil interests, who were fearful there would be an attempt to condemn lands producing or capable of producing oil or gas; for some members of the natural gas industry, who thought an attempt might be made by one natural gas company to condemn a partially depleted field belonging to another; and from the Texas Independent Producers and Royalty Owners Assn. All opposition except that of the latter has apparently been satisfied."

At the time Mr. Hedrick made his talk, the physical work of readying Herscher was 60% complete, and gas was to be placed in formation in April. By August, the initial amounts were to be stepped up measurably so that withdrawals can be made on a limited basis next winter.

mercial use. But exploration revealed a porous limestone strata at 1100 ft which it was thought might have characteristics necessary for a storage field. CILCO took an option to buy the oil and gas leases depending on the outcome of tests to prove the suitability of the limestone strata as a storage field.

The limestone proved to be impractical, but reports of a geologist pointed out the possible use of the St. Peter's sandstone as a gas storage reservoir. The cost of exploring this formation was more than CILCO could undertake and it enlisted the support of its supplier, Panhandle, in the investigation.

Seven shallow slim holes, 700 ft deep, have been drilled to define and outline the dome and to determine whether a fault exists on the west side of the dome. Plans include drilling of 10 to 13 additional slim holes.

Transmission panel tells new developments at SGA

O. W. Clark of Southern Natural Gas Co., who was elected new chairman of the transmission section of the Southern Gas Assn., presided, and Thomas S. Bacon was moderator at an information panel on natural gas transmission at the SGA annual convention in New Orleans last month.* The panel gave delegates a chance to discuss their problems with experts, and brought them up to date on several specific fields of natural gas transmission.

The first report, given by A. L. Bristo of Northern Natural Gas Co., was on the dispatcher's round-table conference. He offered many new ideas on out-guessing load changes, utilizing underground storage, and keeping a transmission system in shape to operate at high efficiency.

The round-table conference on pipeline operations, maintenance and construction was outlined by W. C. McGee Jr. of Tennessee Gas Transmission Co. He told delegates of recent improvements resulting in more efficient transmission lines at less cost in steel and manhours to install and operate.

The increase in use of radio, both in mobile units and fixed stations, the use of microwave for communications, telemetering, and control were discussed by H. A. Rhodes, Transcontinental Pipe Line Corp.

Delegates heard from John M. Stark, Southern Natural Gas Co., the changes in methods of handling right-of-way acquisition.

Notes of the round-table discussion on gathering and processing gas were read by C. L. Moore, El Paso Natural Gas Co. He indicated that a satisfactory scrubber has been found for removal of liquids from natural gas.

The final panel member to speak was T. H. Pofahl, also of El Paso, who covered recent changes in the type of equipment available and in use for compression. He also reported on the work being done by the Southwest Research Institute on the piston type compressor and applied the accoustical theory to explain some of the operating irregularities that have been caused by pulsation.

*For complete convention coverage, see Association News, p. 69.

C. L. Perkins, El Paso Natural; Fred A. Hough, Southern Counties; and F. S. G. Williams, Taylor Forge & Pipe, were speakers on the program of the transmission section meeting at the SGA convention.

Buchanan receives Hanlon award at NGAA meeting

The Hanlon award, highest honor in the natural gasoline industry, has been conferred on Darst E. Buchanan, president, Hiwan Oil & Gas Co., Houston. The presentation was made at the 32nd annual convention of the Natural Gasoline Assn. of America held in the Rice hotel, Houston, April 29-May 1.

Mr. Buchanan is the 17th recipient of the Hanlon award, which is made each year for outstanding service to the natural gasoline and cycling industries. Donor of the award is E. I. Hanlon, chairman of the board of the National Bank of Tulsa, and a pioneer in the natural gasoline business.

The presentation was made by NGAA President John F. Lynch, president of La Gloria Corp., Corpus Christi.

Permian-Northern-El Paso construction approved

The FPC has authorized construction of facilities by Permian Basin Pipeline Co. and Northern Natural Gas Co., Omaha, and El Paso Natural Gas Co., designed to bring an additional 300 MMcf of gas per day to Northern.

Permian will construct, at a cost of about $42.5 million, a system of 164 miles of 16- to 30-in. pipe and four compressor stations totaling 54,880 hp in Texas and New Mexico. Through these facilities it will deliver 200 MMcf per day in the first year and 300 MMcf thereafter to El Paso in Yoakum county, Texas. (See May *GAS*, p. 150.) Permian's gas supply will come from three main sources—the Spraberry trend and the Mitchell field in Texas and various pools in Lea county, N. M.

The commission pointed out several deficiencies in the company's financing plan and required them to file a definite plan, satisfactory to the commission, within 60 days.

Northern's authorization covers only the first year's construction program of approximately 259 miles of 24- to 30-in. mainline and loop and a total of 50,400 hp in compressor capacity, to be located in Texas, Oklahoma, Kansas, Nebraska, and Iowa, at an estimated cost of $33,273,000.

The compressor and regulator stations necessary to handle the exchange of the gas will be built by El Paso at its Dumas station at an approximate cost of $2.9 million.

Combination drilling tests found faster but costlier

A combination of rotary and cable tool drilling methods has been found more expensive but considerably faster than the use of cable tools alone in the Leidy and Driftwood (Pa.) gas fields, John W. Hendrickson, assistant superintendent of production and transmission of New York State Natural Gas Corp., Pittsburgh, reports.

Mr. Hendrickson revealed some comparative cost data at the recent spring meeting of the eastern district of the API division of production held in Pittsburgh, headquarters of his company.

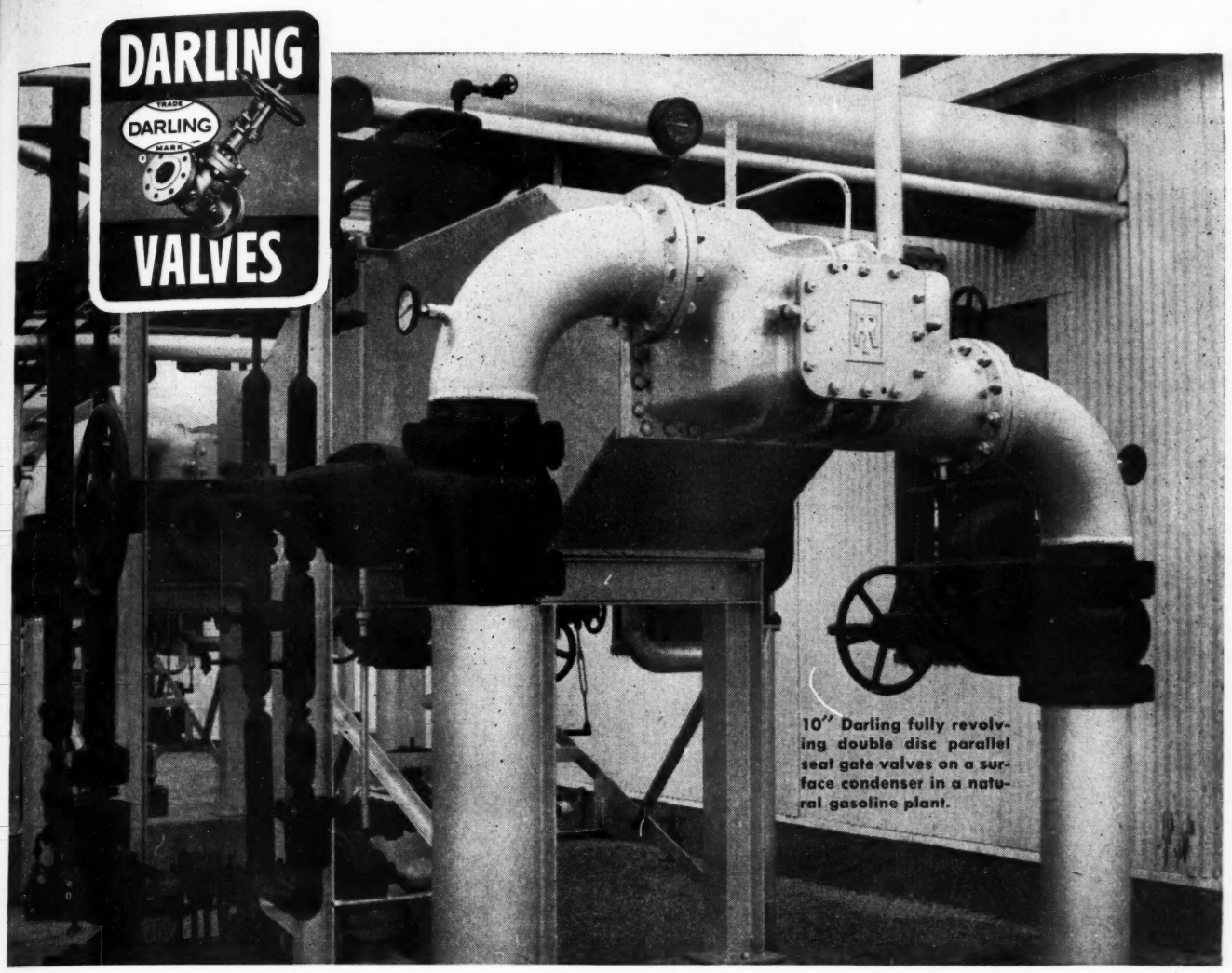
Costs of the combination method "are not prohibitive for drilling development or in-pool wells where speed is a prime factor," Mr. Hendrickson reported. "For wildcat wells drilled to approximately 8000 ft, combination costs considerably exceed those of cable tools."

The nature of the porosity and permeability of the sands in the fields, making for rapid depletion, dictated the use of the rotary method. The still unanswered question is whether the value of the additional gas produced offsets the extra cost, he indicated.

Three methods were employed in the tests, using several combinations of tools. The cheapest of these averaged out at $8.17 per ft as against $5.83 for cable tools. Drilling with rotary alone may run to $15 or $20 per ft, he said. As a result, it is believed that rotary drilling contractors will have to revise their present procedures before rotary drilling will become widespread in the Appalachian district.

Hope plans underground storage project

The Hope Natural Gas Co., Clarksburg, W. Va., has applied for certificate to develop an underground natural gas storage pool in Lewis and Harrison counties, W. Va. The project, expected to cost about $1,236,000, would include 15.2 miles of gathering lines



10" Darling fully revolving double disc parallel seat gate valves on a surface condenser in a natural gasoline plant.

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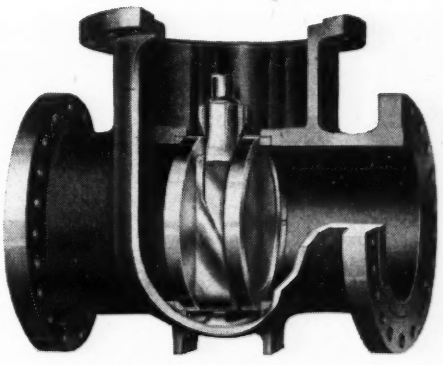

Cutaway showing complete simplicity of the Darling fully revolving double disc parallel seat principle.

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and a 3.73-mile, 12¾-in. transmission line.

The capacity of the storage pool to be activated is approximately 20 MMcf. To be known as the Kennedy storage area, it has long been used by Hope for production of gas. Forty-six of the field's existing wells would be reconditioned and 15 abandoned wells would be redrilled for the program.

Price Tower soon to enhance Bartlesville skyline

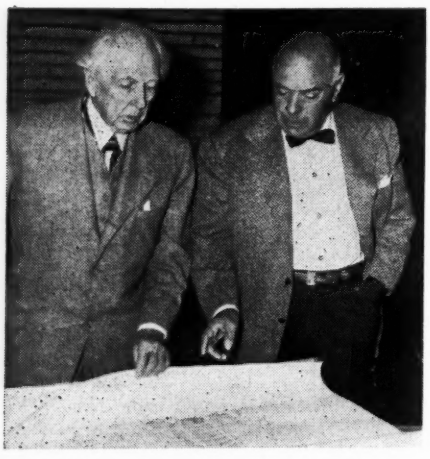
The skyline of Bartlesville, Okla., will soon have an imposing new tower rising in majestic modernity to 186 ft—18 stories. World famous architect Frank Lloyd Wright has designed this unique skyscraper, the Price Tower, to be built by H. C. Price Co.

The Price company offices will occupy the top three office floors and other facilities of the combination office and apartment building. A two-story wing branching off from the tower will be occupied by the area offices of the Public Service Co. of Oklahoma. The first skyscraper designed for dual purposes, it will have eight spacious two-story apartments and office space on 10 floors available for rental. There will also be locations for specialty shops on the ground and mezzanine levels.

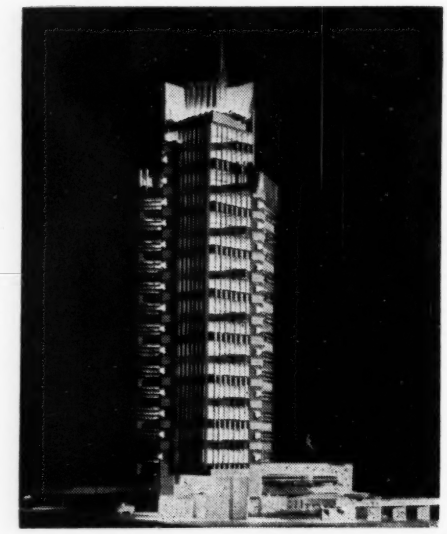
The tower section will set diagonally on a 140- by 150-ft lot. It will be composed of four equal and independent sections or quadrants—three to be offices and one for apartments. The faces of the towers will be about 45 ft wide. The tower will be a cantilever-style structure with the floors and walls suspended from four vertical reinforced concrete supports, 18 ft wide and 10 in. thick. They will rest on a 3-ft thick concrete platform 25 ft below the surface.

Because of the design and materials used, the entire structure is expected to weigh only one-seventh as much as a building of similar size in Rockefeller Center. Some of the design features include the use of poured concrete for floors, concrete and glass for walls, protective metal louvres as shields for the extensive glass surfaces. These 20-in. louvres, or vanes, will be set vertically in the apartment quadrant on the southwest corner of the building and horizontally on the tower's other three quadrants.

It is contemplated that a contract for the new building will have been awarded and ground broken by mid-June. It is expected to take 12 months to complete the structure.



Harold C. Price, right, president of H. C. Price Co., reviews plans for the new Price Tower with the world-famous architect, Frank Lloyd Wright, designer of the unique skyscraper.



The wide expanse of windows reflects the brilliant illumination in this night view of the model of the Price Tower soon to be erected in Bartlesville, Okla.

FPC calls huddle to settle Mississippi rate dispute

Mississippi River Fuel Corp. of St. Louis, its customers, interested state regulatory bodies, and the FPC sat down together last month to disentangle matters concerning its $6.5 million rate boost. The conference was called as a sequel to the issuance of an FPC order in late April making the much disputed boost effective as of April 10, subject to refund.

Mississippi was the instigator of the meeting, and because of it FPC ordered that no bond would be required until 60 days after the date of the order. Upon its completion, commission hearings were to be reconvened; in case of agreement by interested parties, an immediate action would be taken, but if no settlement were to be reached, hearings would be recessed until a later date.

The case had been reopened April 10 by Mississippi following a court action Feb. 9 which vacated an FPC order of May 29, 1952, rejecting a rate increase petition without hearings. (For further details on the decision, see GAS for April 1953, page 32.) This had been followed by motions for modification of opinion, filed by both parties. FPC's objection to an implication in the court's language was acknowledged, but Mississippi's appeal for an order making the increases retroactive to June 1, 1952 was denied. The court cited the position of Laclede Gas Co. of St. Louis, a Mississippi wholesale customer, which would have had to cough up an extra $3 million to pay for gas purchased since that date, a loss which could not be recouped from its own customers.

Final decision filed on Columbia Gas System plans

In a final decision superseding an intermediate order issued March 5, FPC has acted on 13 applications by 10 companies. Among them were authorization of projects of seven Columbia Gas System companies and denial of one.

Projects involved total over $13.5 million including 187.1 miles of line and 12,480 hp compressor capacity. Also approved was a 22-mile line, to cost $304,596, to be built by Rockland Light & Power Co., Nyack, N. Y. Home Gas was ordered to supply it with gas. An application by Shenandoah Gas Co., Lynchburg, Va., for 39 miles of line and five short laterals was separated from the proceedings and will be held open for presentation of new evidence. It is also seeking an order directing Virginia Gas Transmission Corp. to supply it with natural gas.

Largest of the projects authorized is Ohio Fuel Gas Co.'s program for 117 miles of line to cost over $4.7 million. These facilities will transport additional gas from the company's two suppliers, meet the growth in several of its market areas and protect the service to three other existing markets.

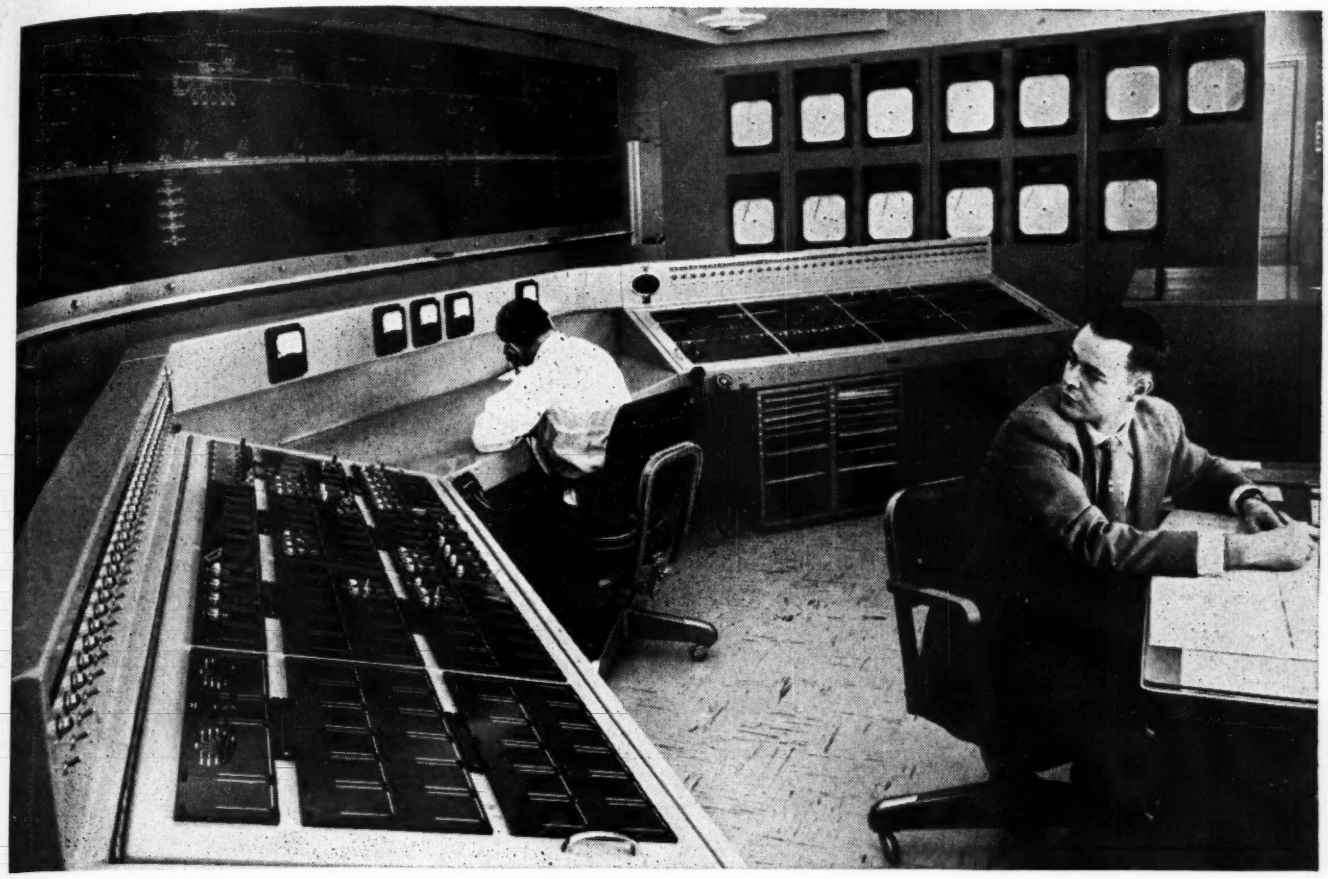
The United Fuel Gas Co. will expand its underground storage operations by building 21.5 miles of line and 4840 hp in compressor units, plus acquiring and activating new storage fields, at a cost of more than $3.5 million. Atlantic Seaboard will spend $3.33 million on two compressor stations totaling 7640 hp to increase its sales capacity by 25.4 MMcf per day.

Other Columbia subsidiaries involved were Manufacturers Light & Heat Co., Natural Gas Co. of W. Va., and Central Kentucky Natural Gas Co. The latter company's request for authority to build 8.8 miles of looping in North Means, Ky., was denied.

Attention going eastward in Canadian gas situation

The Canadian natural gas export situation continued last month to sink deeper and deeper into a sea of complexities and rivalries, but attention for the moment seemed to have swung toward the east. Newest element was the brand new scheme of a world famous firm of engineers and constructors, the Bechtel Corp., for piping gas to the Ontario-Quebec market.

The Bechtel plan encompasses the use of the Buffalo and Detroit markets on a short term basis to take up the lag between supply and demand in the eastern Canada pro-



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inces, thus enabling the building of a 36-in. line which would have an initial input of 500 MMcf. Larger capacity of the line as compared to its competitors (36-in. pipe as against 30-in.) would decrease costs to the customer. The two American cities would receive 200 MMcf per day until the Canadian market was ready to absorb it.

It was reported in Toronto that the plan grew out of a survey made by Bechtel at the behest of producers, consumers, and government authorities.

Meanwhile, in mid-May Alberta's conservation board was hearing three rival applications—Alberta Natural Gas, a subsidiary of Northwest Natural, the contender for the Pacific Northwest market; Western Pipelines Ltd.; and Trans-Canada Pipe Line Co.

Alberta Natural wants to export reserves from southern Alberta to Saskatchewan, Manitoba, Ontario, and Quebec, with connections on the U. S. border en route for delivering "surplus" gas, and to serve the eastern portions of the Pacific Northwest territory—Idaho, Nevada, Montana, and Utah.

Western, which had sought to export gas from Pincher creek to Winnipeg and a point on the border near Emerson, Man., for delivery to Minneapolis-St. Paul, with a branch line to Saskatoon and Prince Albert, is now asking for an extension to eastern Canada through Fort William, Sudbury, and Port Arthur, with a boost in capacity from 275 MMcf to 550.

Trans-Canada offered no amendments to its plan to build a 2240-mile all-Canada line to the east.

In the West, the fight being waged against Canadian imports by Seattle's N. Henry Gellert continued unabated. In a talk before New York security analysts, Mr. Gellert reiterated his refusal to allow the "economy of the Pacific Northwest to become a vassal of a foreign nation," and questioned that the "Bechtel report" (*GAS*, May, p. 150) is "either impartial or objective" as claimed. Mr. Gellert declared that the 22-year permit granted by Alberta does not protect U. S. customers, and that the act under which the permit was granted allows the government to impose export duties up to 10 cents per Mcf, a device which would permit the Canadian government to price the gas out of the American market at such time as it might want to preserve most of it for Canadian use.

The position of Westcoast was further solidified in early May when the Canadian Board of Transport Commissioners okayed the second phase of the company's proposal, consisting of a spur line from Brookmere, B. C., on the Peace river-Vancouver arm, to Osoyoos on the border, feeding Spokane, Hanford, and northern Idaho as well as other parts of British Columbia.

Spraberry shutdown order to Texas supreme court

The Texas Supreme Court is being asked to set aside the decision of District Judge Charles O. Betts that non-flaring oil wells in the Spraberry field may continue producing while other wells are closed. The appeal was filed by Attorney General John Ben Shepperd, direct to the state's highest court, after Judge Betts refused to go along with the Railroad Commission in its blanket order of April 1 closing 2200 wells in the area until conservation measures were taken to save the casinghead gas being flared.

The commission contends that the Spraberry reservoir must be considered as a unit in order to protect the property rights of all operators to recover their proportionate share of the oil. The prospect that the high court might reverse the trial court and uphold the commission's power to order field-wide shutdowns may spur industry efforts to install transmission lines needed to care for the vast gas supply.

Trio buys 33-year old Parkhill Truck Co.

The Parkhill Truck Co., Tulsa, has been bought by Kenneth A. Owen, Trap Briscoe, and Howard S. Lipp, who will be president, vice president and general manager, and vice president, respectively. The 33-year-old com-

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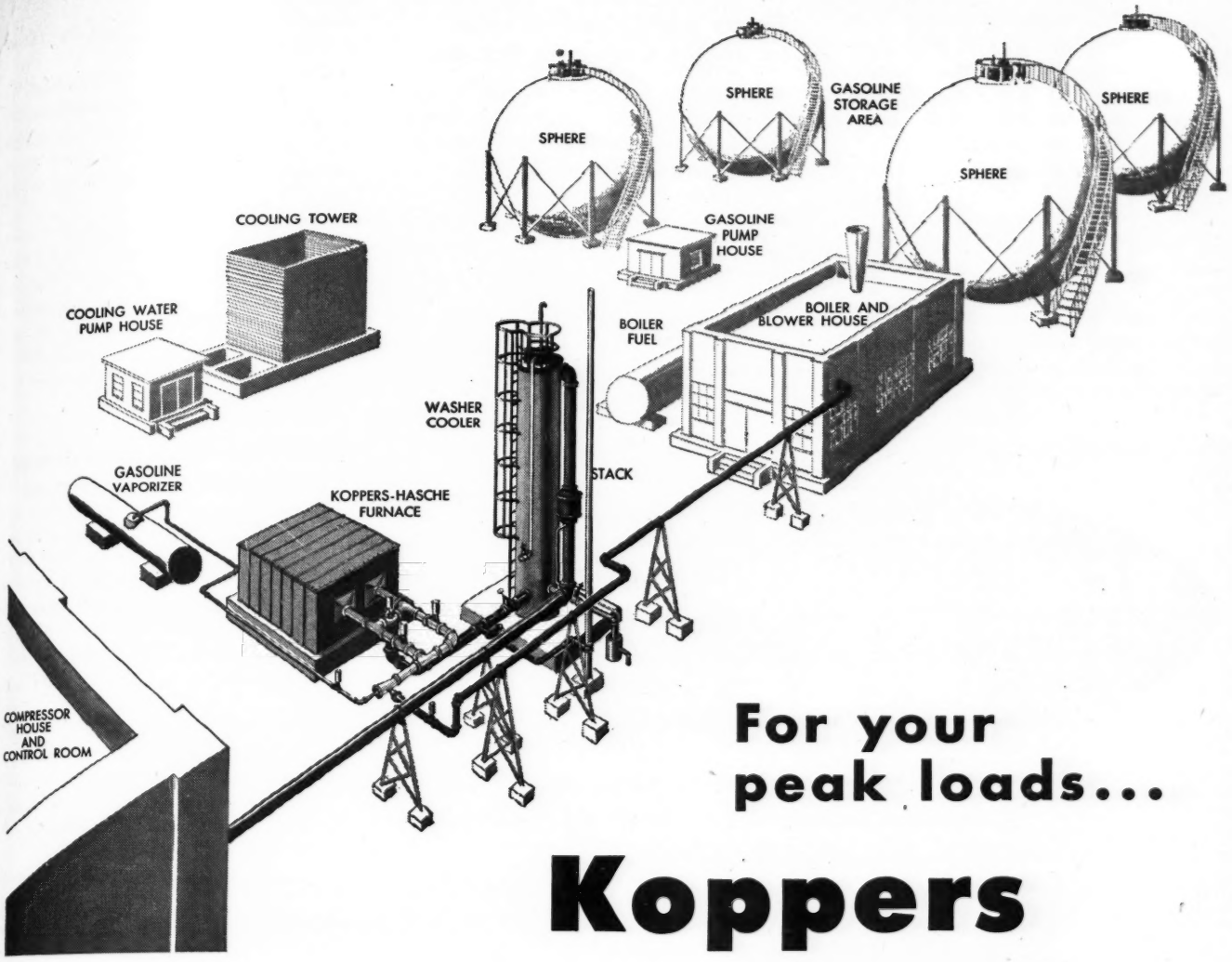

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pany, which was founded by Roy F. Parkhill, is one of the largest oil field hauling and pipeline stringing firms. Equipment involved in the purchase includes more than 200 trucks, tractors, full swing cranes, trailers, floats and low-boy equipment.

The company will continue its services in the hauling and pipe stringing field, according to Mr. Briscoe, former chief accountant for Brown Shipbuilding Co., Houston, and secretary-treasurer for Parkhill since 1946. Mr. Owen worked on the "Big Inch" and "Little Inch" lines during World War II and later joined the Williams brothers companies. Mr. Lipp has been vice president of Midwestern Constructors.

Firms with bonded rates in effect seek new boosts

Three companies whose previous requests for rate increases have already passed FPC's five-month suspension period and are now effective under bond, now find themselves back on the dockets with new rate boost petitions.

Manufacturers Light & Heat Co. and Home Gas Co., two Columbia Gas subsidiaries in Pittsburgh, are asking for respective increases of $1,343,000 (or 7.75%) and $286,600 (or 3.4%). Their previously sought boosts have been effective under bond since Nov. 1. Home, which buys gas from Manufacturers, listed its supplier's petition as a factor in its case.

Hope Natural Gas Co. of Clarksburg, W. Va., which already has a $2,334,000 increase in effect under bond, had a new $3,830,000 proposal suspended. This amount would represent a 10% jump for the year ending April 30, 1954.

Two rate increases made effective under bond in April and a third on May 2 were for Natural Gas Pipeline Co. of America, Chicago, $3,511,000; United Natural Gas Co., Oil City, Pa., $1,749,000; and East Tennessee Natural Gas Co., Knoxville, $487,000. All three had been under suspension since last fall.

South Georgia plan denied; Southern Natural okayed

The FPC last month filed the final decision on the consolidated applications of Southern Natural Gas Co., South Carolina Natural Gas Co., and South Georgia Natural Gas Co., authorizing construction by the first two companies but denying South Georgia's application. (See April *GAS*, p. 128.)

This company's proposed project would have included 335 miles of line in Alabama, Georgia, and Florida to serve five industrial customers and 11 communities in Georgia and three communities in Florida at a cost of $8,141,518.

In denying the application, FPC pointed out that "the company's own view of the project is not financially feasible unless the commission adopts South Georgia's proposed city gate rates." It contended that the proposed rates are not warranted by the record. "The whole thrust of this project is the subsidization of the large volume of direct sales by the lesser volume of resale sales," the order said.

Notes

Texas Eastern Production Corp. President H. A. Hemphill has announced that the company is purchasing present producing property of Meredith, Clegg & Hunt in the West Hamshire field of Jefferson county, Texas, for $9.6 million. Production of the area is about 20 MMcf per day. The gas is being purchased by Texas Eastern Transmission Corp. and is processed by Texas Gas Corp. at its gasoline plant near Winnie, Texas.

The Washington (D. C.) Gas Light Co. has received a certificate from FPC authorizing it to acquire and operate all the natural gas facilities of Prince George's Gas Corp., Chillum, Md. The wholly-owned subsidiary owns lines which carry gas from a point near Rockville, Md., to the District of Columbia; a storage and compressor stations; and facilities totaling $4.5 million

Pat. 1,234,567
Other Pat. Pend.

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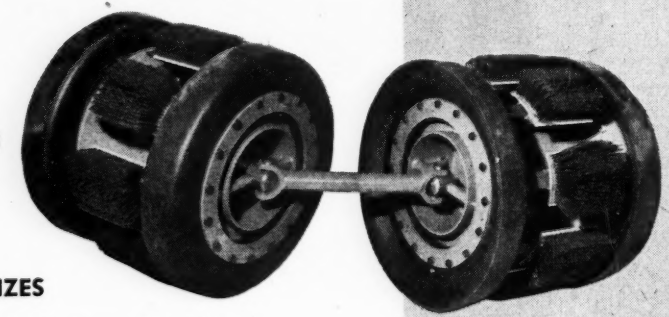

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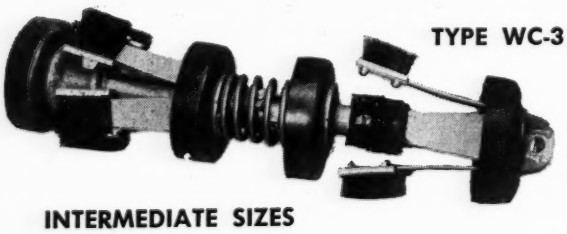

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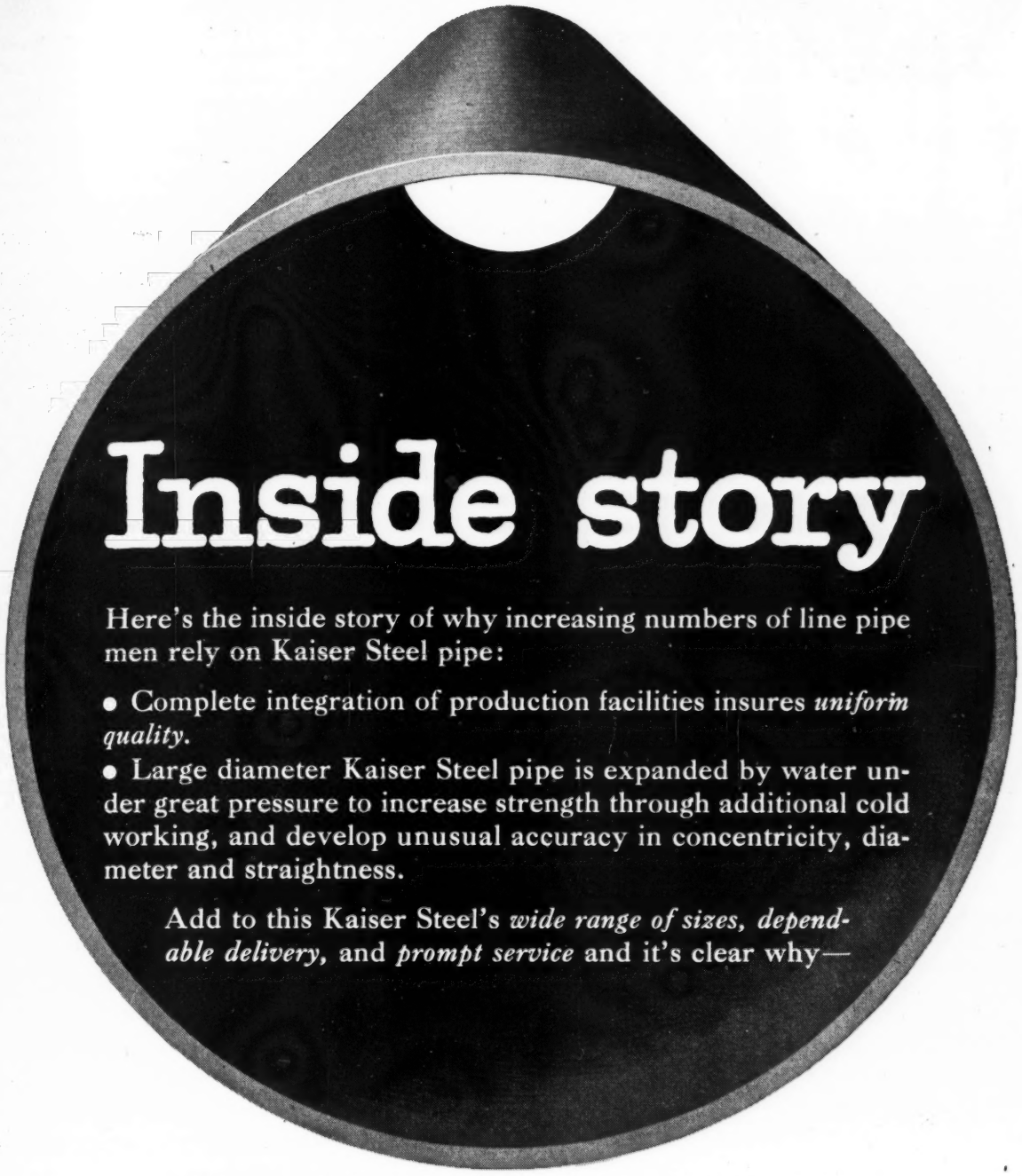

Inside story

Here's the inside story of why increasing numbers of line pipe men rely on Kaiser Steel pipe:

- Complete integration of production facilities insures *uniform quality.*
- Large diameter Kaiser Steel pipe is expanded by water under great pressure to increase strength through additional cold working, and develop unusual accuracy in concentricity, diameter and straightness.

Add to this Kaiser Steel's *wide range of sizes, dependable delivery,* and *prompt service* and it's clear why—

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Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

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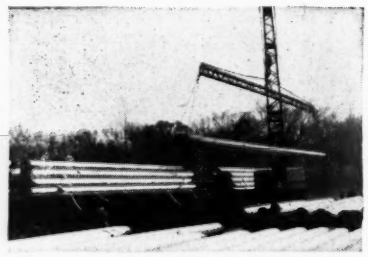
*spi FIRSTS in c/w pipe standards

*** standard pipeprotection inc. designed and built the first plant to include all the machines and methods and procedures necessary to set the highest standards, and to produce the finest coated and wrapped pipe.**

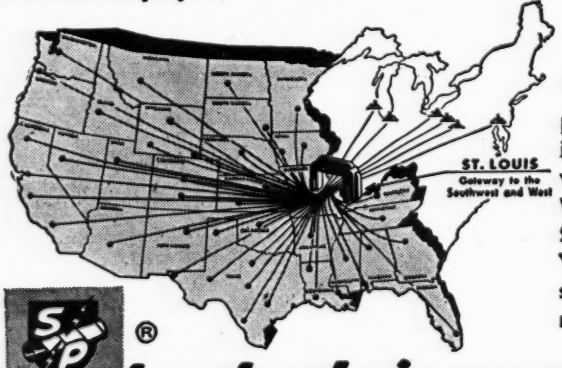
FIRST plant to use steel grit cleaning exclusively, on every piece of pipe, regardless of size . . . no other cleaning method is used in this plant. Steel grit cleaned surfaces are made up of many tiny facets, inclined toward each other at various angles, which help to key or bond the coatings to the steel.



FIRST plant to equip all cranes with spreader bars, while your pipe is being unloaded and loaded . . . to prevent pick-up cables putting the pipe under longitudinal strain, eliminating damage, dogleg bending or damage to pipe ends.

FIRST plant to provide warm air conditioned storage areas for wrappings — felts, glass, and paper — in order to prevent their absorbing moisture from the atmosphere. If wrappings with a high moisture content are applied to the pipe, the hot enamels vaporize the moisture, thereby causing excessive holidays.

Standard procedures provide application to customers' specifications, in accordance with your regular procedures . . . any of the coating manufacturers' materials . . . and in any combination of applications of these coatings, felts, wrappers, glass and kraft paper.



COATING AND WRAPPING-IN-TRANSIT

permits stop-off for processing or storage at St. Louis without freight penalty. When you ship through the St. Louis gateway, you enjoy "through freight rates" instead of the higher combination rates generally used.

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The Southwest regional office of Motorola Communications & Electronics Inc. has been moved from 6310 Denton Drive, Dallas, to 171 Parkhouse St. in the Trinity industrial district of Dallas. The move will permit expansion of its field engineering organization to meet the increased demand for two-way radio communication systems in that fast growing section of the country.

The Panhandle Eastern Pipe Line Co., Kansas City, Mo., has been authorized by an order of the FPC to operate about 19 miles of 8-in. and 13 miles of 6-in. line paralleling existing Panhandle laterals near Crawfordsville and Lebanon, Ind. The facilities were built by Indiana Gas & Water Co. Inc., Indianapolis, to increase natural gas deliveries to that company in the area of the two cities.

The Federal Power Commission offices were moved last month from the State Department building at 1778 Pennsylvania Ave. and the Hurley-Wright Bldg. at 1800 Pennsylvania Ave. to the second floor of the new General Accounting Office building at 441 G St. N.W. The move affected about 473 employees.

Construction is expected to begin soon on the $4 million natural gas transmission line from Clear Creek field, Utah, to a point about 40 miles south of Salt Lake City. The Utah Public Service Commission has granted Utah Natural Gas Co. permission to construct the 63-mile, 18-in. line. It will carry at least 50 MMcf of gas daily into the Salt Lake-Provo area where the gas will be distributed by Mountain Fuel Supply Co. Construction is expected to be completed in time to supply gas for next winter.

New Products

For additional information on these products use coupon on p. 58.

18 Pipeline Felt

Nicolet Vitrabestos is a glass scrim-reinforced asbestos pipeline felt with reinforcing in both directions on ½-in. spacing. Advantages include greater application strength—

the enamel bleeds into the felt; gases will escape freely through the Vitrabestos; longer rolls can be used; it is flexible, no breaks and fewer stops for roll changes; its soil stress resistance is greater and backfill and lowering in damages are lessened.

Middle West Coating & Supply, distributor

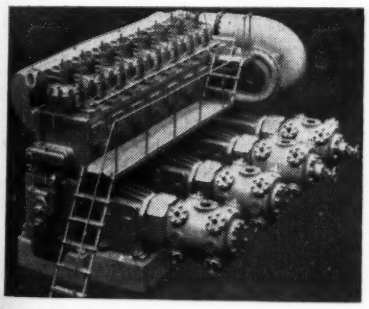
■

19 Lubricant Tubes

Two newly designed lubricant tubes, a flat-top gun lubricant tube and a long-spouted bulk lubricant tube, are now offered by Rockwell Manufacturing Co. for simpler, more effective and economical lubrication of Nordstrom valves. A lube-gun can be loaded in a matter of seconds with the flat-top tube by cutting off the tube top and turning a key which squeezes the contents into the barrel. The long-spouted tube gets the lube further down into the valve shank than with previous methods. It also simplifies inventory because one tube fits all Nordstrom valve sizes. Gun lubricant tubes are available in packages of six; the bulk tubes singly and in packages of four.

Rockwell Manufacturing Co.

■



20 Right Angle Compressor

The new Clark Model TRA-8 is a turbo-charged two-cycle right angle gas engine-driven compressor unit. It develops 1320 hp, has eight vertical in-line cylinders of 14-in. bore and 14-in. stroke, integrally connected to horizontal compressor cylinders. Outstanding features are: 50% more power than any non-turbocharged unit; new lows in fuel consumption; fuel consumption that

PROOF

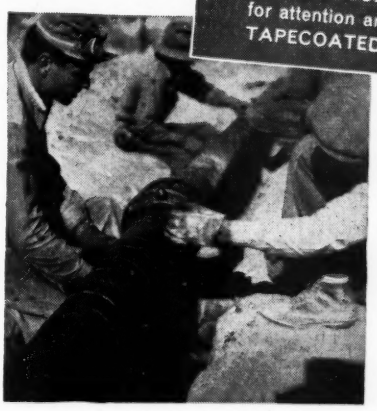
HERE'S HOW TAPECOAT® HAS STOOD THE TEST OF TIME TO SOLVE CORROSION PROBLEMS

PROOF (Underground) — Inspection of TAPECOATED joints after 10 years of underground service showed no sign of corrosion when the TAPECOAT was removed.

PROOF (Alternate wetting and drying) — Expense and trouble in protecting lines subject to wet and dry conditions at cooling towers have been eliminated since 1944 by coating with TAPECOAT.

PROOF (Underwater)—During the re-laying of an underwater pipe line in the Gulf area, examination showed that TAPECOAT had protected the pipe against salt water corrosion and barnacles.

PROOF (Above ground)—A gas line at a bridge crossing was TAPECOAT-protected in 1944. There has been no need for attention and no interruption of service since the pipe was TAPECOATED.



Actual experiences like these show what TAPECOAT coal tar protection can do for you.

Use TAPECOAT to combat corrosion above or below ground on gathering lines, transmission lines, meter stations, compressor stations, distribution lines, pipe joints, bolt-type couplings, fittings, large bends, large diameter pipe, insulated lines, tanks, and other surfaces subject to corrosion.

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Originators of Coal Tar Tape Protection

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remains practically constant between 70% of load and maximum; 25% less water cooling load; quieter operation; compact accessible two-cycle in-line design.

Clark Bros. Co.

■

21 Hydraulic Outrigger

Hydraulically operated outriggers are now available as optional equipment on the Model "B" Pitman Hydra-Lift, truck mounted crane with loadline capacity of 6400 lbs and power swing boom which telescopes from 12 to 22 ft. Hydraulic power swings the boom 180°, lifts it through an arc of 100°. Outrigger legs can be raised and lowered instantly simply by manipulating controls at the regular operating station. This cuts time on jobs, such as stringing pipe, pulling paving forms and unloading materials, where outriggers must be used frequently. The ease of operation also constitutes an important safety feature.

Pitman Manufacturing Co.

Progress Reports

PLANNED

CAROLINA NATURAL GAS CORP., Charlotte, N. C. Docket G-1956 for 40 miles of line to connect with Transco line near Kings Mountain, N. C., extending to Rock Hill, S. C., with laterals to four South Carolina points.

CENTRAL WEST UTILITY CO., Kansas City. Docket G-1682, four alternate plans to serve Clay county, Mo.

CHATTAHOOCHEE NATURAL GAS CO., Birmingham. Docket G-2066 for 70 miles of line in northwest Georgia, to connect with system of Southern Natural in Floyd county.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2149 for 69 miles of line—44 miles 20-in.; 25 miles 16-in.—and 1100-hp addition to Edmond compressor station in Oklahoma county.

COLORADO INTERSTATE GAS CO., Colorado Springs. Dockets G-2120 and G-2121 for 365-mile, 22-in. line from Denver to connection with proposed Pacific Northwest Pipeline Corp. line at Green River, Wyo., with 5500-hp compressor station at Green River; and 49 miles of 20-in. line parallel to existing 20-in. line to Denver; 30 miles of 12-in. line to connect 20-in. line in Colorado with Morton county, Kan. compressor station; and 24,860 hp in compressor capacity at new and existing stations in Colorado, Oklahoma, Texas and Kansas.

CONNECTICUT GAS CO., Berlin. Docket G-1954 for 3 short pipelines, totaling about 2 miles, to extend from Connecticut Light & Power gas plants to Algonquin Gas Transmission Co. from plants at Waterbury, Willimantic and Putnam, Conn.

EAST OHIO GAS CO., Cleveland. A 125-mile, 26-in. pipeline to serve Cleveland area from point just south of Toledo.

EL PASO NATURAL GAS CO. Docket G-2106 for total of 1792 miles of line to include about 750 miles of 30-in. and 70 miles of 24-in. mainline with related gathering lines, purification facilities and compressor plants totaling 161,860 hp to carry gas from Permian and San Juan basins.

EQUITABLE GAS CO., Pittsburgh. Docket G-2130 to activate the Logansport storage field in the Big Injun Sand, Marion county, W. Va., install a 1320-hp compressor station in Wetzel county, about 9 miles of 12-in. line from storage pool to compressor station, and various 6-in. and 8-in. well connecting lines.

FREDERICKSBURG NATURAL GAS CO., Fredericksburg, Va. Docket G-2041 for 28½ miles of 4¼-in. line and .72 mile of 3½-in. line connecting with Transco line, extending to Fredericksburg and area.

GLACIER GAS CO., Butte, Mont. Dockets G-1816, G-1817, G-1818 for 285 miles of 20-in. line from northeast of Kalispell, Mont. to Spokane, Wash.; 91 miles of 8⅝-in. from Spokane to Lewiston, Idaho; 120 miles of 16-in. from Spokane to Hanford, Wash.; 130 miles of 12¾-in. from Spokane to south of Trail, B. C.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Point Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states.

HOPE NATURAL GAS CO., Clarksburg, W. Va. Docket G-2156 for 15.2 miles of gathering line, 3.73 miles of 12¾-in. transmission line, reconditioning of 46 wells, and redrilling of 15 to develop new Kennedy storage area in Lewis and Harrison counties, W. Va.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo. Docket G-1509 for 25 miles of 6-in. from Moberly to Macon, Mo.

MISSOURI PUBLIC SERVICE CO., Warrensburg. Docket G-2057 for 109.3 miles of 8- and 10-in. mainline and 27.1 miles of lateral lines. System to connect with Panhandle Eastern Pipeline Co. line at Franklin, Mo. and extend northwest.

MORGANFIELD NATURAL GAS CO., Morganfield, Ky. Docket G-1935 for a 31-mile, 4- and 6-in. line lateral to proposed Texas Gas Transmission Corp. line, to serve six Kentucky communities.

NEW YORK STATE ELECTRIC & GAS CORP., Ithaca. Docket G-1999 for total of 49 miles of pipeline; 25 miles 10-in. from DeRuyther to Norwich, N. Y., 24 miles 8-in. from Norwich to Oneonta, N. Y.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1980 (in part) for a 75-mile, 20-in. line from southern end of Driftwood field line to main dual line in Armstrong county, Pa. To be constructed in 1953.

NORTHERN NATURAL GAS CO., Omaha. Docket G-1918 for 400 miles of 24-in. pipe from the United States-Canadian border to a point near Minneapolis and two compressor stations with 5280 hp each.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2009 for a 1.4-mile, 8⅝-in. branch line from its Omaha branch line to a proposed regulating station near La Platte in Sarpy county, Neb.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2063 (in part-second year program) for 204 miles of 24-, 26- and 30-in. mainline additions to connect with Permian Basin Pipe Line Co. system, and 22,800 hp in new and existing stations in Texas, Oklahoma, Kansas, Nebraska, Iowa, Minnesota and South Dakota. Also 473 miles of branch lines and additions to serve customers in Iowa, Minnesota, Nebraska and South Dakota.

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COMPANY_____

NAME_____ POSITION_____

STREET CITY ZONE STATE

NORTHERN NATURAL GAS CO., Omaha. Docket G-2125 for 51 miles of line—including 36 miles of 30-in. mainline loop—in Texas, Oklahoma and Kansas.

NORTHWEST NATURAL GAS CO., New York. Docket G-996 for 992 miles of 18-, 20-, 22-, and 24-in. line in Washington, Idaho, Oregon and British Columbia, together with laterals and four compressor stations aggregating 30,800 hp.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2102 to build about 259.7 miles of 34-in. mainline loops and 15,000 hp in compressor capacity on line from Topock, Ariz. to a point near Milpitas, Calif.; and 6.5 miles of line between Milpitas and Irvington, Calif.

PACIFIC NORTHWEST PIPELINE CORP., Houston. Docket G-1429 for 1466 miles mainline; 380 miles of spur and lateral lines; and 16 compressor stations totaling 104,420 hp, to extend from Ignacio, Colo., in the San Juan basin, to Bellingham, Wash. (Seattle area).

SHENANDOAH GAS CO., Lynchburg, Va. Docket G-1448 for 39 miles of line from a point near Middletown, Va. to points near Winchester, Va. and Martinsburg, W. Va.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-2104 to build about 73 miles of 30-in. mainline loops and 5280 hp in additional compressor capacity at Blythe on existing line extending from Blythe to Santa Fe Springs, Calif.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1969 for certificate to perform natural gas transmission service for Niagara Gas Transmission Ltd., Toronto, and Iroquois Gas Corp., Buffalo. To construct 574-mile, 30-in. line from Kinder, La. to join existing system; 130 miles of loop line; a 45-mile spur from near Buffalo to international border; submerged crossing of the Niagara river; 17,520 hp additional at existing compressor stations; 3 new stations; and 158 miles of lateral lines.

TRANS-CANADA PIPE LINES LTD., for 2200-miles 30-in. line from Alberta to Toronto; 24-in. line from Toronto to Montreal with 14-in. line to Ottawa; 747-mile gathering system and 13 compressor stations totaling 94,160 hp.

TRANS-NORTHWEST GAS INC., Spokane. Docket G-2111 for construction of a 475-mile system to serve markets in eastern Washington and northern Idaho, starting at international border near Osoyoos, B. C., south to Hanford, Wash., east to Spokane and Wallace, Idaho, north again from Spokane area to Trail, B. C.

UTAH NATURAL GAS CO., Salt Lake City. To build a 62.8-mile 18-in. pipe from fields in Carbon, Emery and Sanpete counties running northwest to a point near Provo. R. H. Fulton & Co. is the contractor.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 396 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states, and 72 miles of laterals and 13 measuring stations. To connect with 923-mile, 24-in. line to be built by parent company, Westcoast Transmission Co. Ltd., from Tangent gas field of Alberta. Location survey under way.

UNDER WAY

ALGONQUIN GAS TRANSMISSION CO., Boston. Facilities including several laterals remain to be completed. Work held up pending further FPC hearings.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2038 for installation of 11,400-hp compressor capacity—three 1600-hp units to be added to its Greenburg station, Kiowa county; six 1100-hp units in a new station in Harvey county, Kan. Expected to be complete Sept. 30, 1953.

EL PASO NATURAL GAS CO. Work in progress on plant construction for 153,000 hp in mainline and booster compressor stations.

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AURORA, ILLINOIS, U. S. A.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, Neb. A 15-mile line from Big Springs to Brule, Neb. Construction to begin about June.

KANSAS NEBRASKA NATURAL GAS CO., Hastings. Docket G-1857. To build 167 miles of line northwest and northeast of Neligh, Neb.; about 51 miles of transmission line in Kansas and Nebraska; and about 111 miles of gathering lines in Kansas, Nebraska and Oklahoma.

LONE STAR GAS CO., Dallas. Docket G-2005 for a 2640-hp compressor station and 5 miles of 12-in. line to New York City field reservoir, Clay county, Texas.

LONE STAR GAS CO., Dallas. A 73-mile gathering and transmission system in Jack and Wise counties with a 3320-hp compressor station—the Jacksboro.

MICHIGAN GAS STORAGE CO., Jackson, has Mahoney Contracting Co. at work on 30 miles of 26-in. line from Laingsburg to Ithaca, Mich. Expect completion by July.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Williams-Austin Co. at work on 10 miles of 20-in. line in Driftwood, Pa. area. Also has contract for 10.8 miles of 20-in. line from Craigs Corners to Caledonia, N. Y. and 7.5 miles of 20-in. from Ithaca to Freeville Gate, N. Y. Pipe Line Construction & Drilling Co. at work on 19 miles of 20-in. in northern Pennsylvania.

NIAGARA MOHAWK POWER CO., Syracuse, N. Y. Williams-Austin Co. at work on 52 miles of 10-in. line from Fulton to Watertown, N. Y. Expect completion Aug. 1, 1953.

NORTHERN NATURAL GAS CO., Omaha. Docket G-1618 for 213 miles of 26-in. loop lines in Texas, Oklahoma, Iowa, Kansas, Nebraska and Minnesota, and 100,160-hp additional compressor capacity. Expect completion in October.

OHIO FUEL GAS CO., Columbus. Dockets G-2013 and G-1985 for five gas pools to be converted to storage; one in Ashland and Richland counties to be added to Weaver storage area; formation of the new Holmes storage area with four pools in Holmes, Wayne and Ashland counties; 34.5 miles of 20-in. line to bring gas in; and a 6000-hp compressor station. Also 97 miles of line to connect areas with existing transmission facilities. Ohio Pipeline Construction Co. at work on 9-mile portion of 20-in. line from Homer to Mt. Vernon; has contract for 7 miles of 16-in. and 10 miles of 3- through 12-in. gathering lines.

OKLAHOMA NATURAL GAS CO., Tulsa. To build 50-mile, 18-in. line from Sapulpa to Pryor, Okla. to serve chemical plant to be constructed by Deere & Co. and Grand River Dam Authority furnaces. Engineering Construction Co., Tulsa, at work. Expect completion by June 25.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1651 for 86.25 miles, 34-in. loop and 19,540 hp addition on existing Topock-Milpitas line. Engineers Limited Pipeline Co. at work on loop construction. Bechtel Corp. at work at Topock, Hinkley and Kettelman compressor stations. Expect completion of project in summer 1953.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1892 for 15 miles of 20-in. pipe extending from Helm and joining the system's Topock-Milpitas line in Fresno county; and for 15.5 miles of 12¾-in. in Madera county parallel to the existing Madera-Livingston line, scheduled for construction in 1953-54.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-1718 for 13,520-hp additions to compressor facilities on existing line from California-Arizona boundary to Los Angeles. To be in operation Sept. 1, 1953.

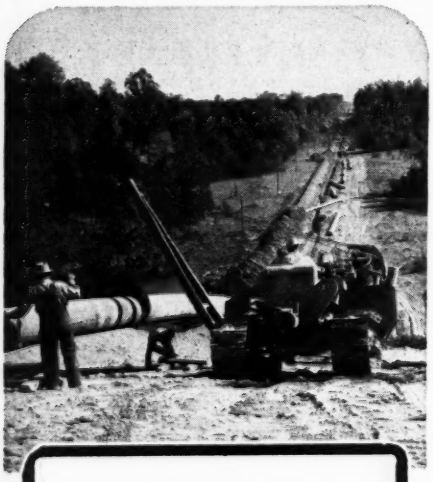
SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. Total project approved including 792 miles of line and 14,200-hp compressor capacity—about 522 miles of looping on existing system with addition of 9800 hp to existing stations; about 270 miles in new lines and a new 4400-hp compressor station. Work underway, about 135 miles completed. Miscellaneous sized lines for gathering system, 384 miles to be laid south of Gwinville, Miss.; 5400-hp compressor at Gwinville; and 3300-hp compressor station at Estopinal, La. Brown & Root Inc., H. C. Price Co. and Houston Contracting Co. at work with completion expected Dec. 1, 1953.

TENNESSEE GAS TRANSMISSION CO., Houston. To build 369 miles of line in 1953, enlarge two compressor stations and complete one new station. Of the total pipe, 173 miles will be 30-in. loop; 74 miles, 26-in. loop; and 132 miles of 24-in. line from Mercer, Pa. to Hebron storage field in Potter county, Pa. Addition of 2640 hp will be made at Carrollton, Ohio station; 2200 hp at Mercer, Pa., and a new 6600-hp station will be built at Kinder, La. H. C. Price Co. and Bechtel at work on Mercer-to-Hebron line. Approximately 80 miles of loop has been completed.

TEXAS EASTERN TRANSMISSION CORP., Shreveport. Docket G-1947 for 315 miles of 24-in. line from a connection with Wilcox Trend line at Provident City, Texas to connection with existing system near Castor, La. Contractors at work: Associated Pipeline Contractors, 75 miles from Lavaca county to Waller county, Texas; Anderson Bros. Corp., 82 miles from Waller county to Polk county, Texas; Williams Brothers Co., 71.4 miles from Polk county to Shelby county, Texas; Pentzien Inc., four river crossings. Scheduled completion date is June 20.

TEXAS GAS TRANSMISSION CORP., Owensboro. Docket G-1847 for 408 miles of 26-in. loop line in six sections. H. C. Price Co. has 44 miles remaining to be completed this spring.

WESTERN SLOPE GAS CO., Denver. About 35 miles of line to complete system from Douglas Creek and Germesa fields to Grand Junction area. Expect completion by fall of 1953.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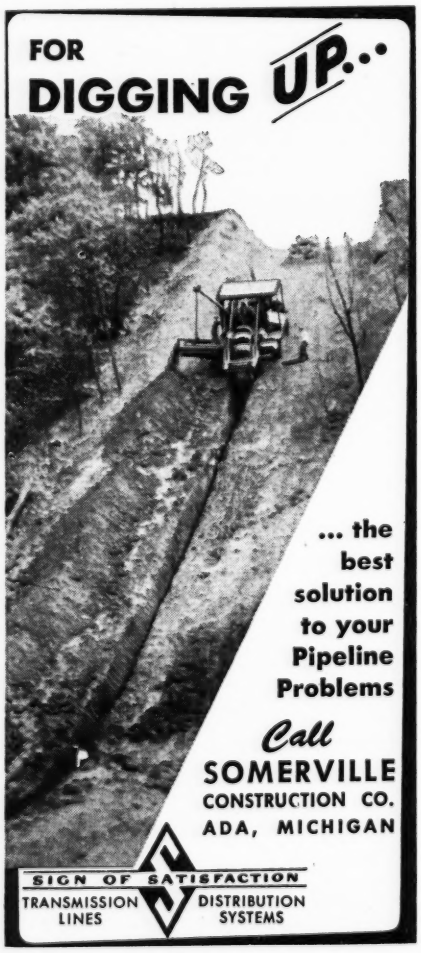
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